12-17-1966

Environmental Control System (ECS) Malfunction Procedure - Reviewed 12-08-1967

National Aeronatics and Space Administration (NASA)

SYMPTOM | PROCEDURE | REMARKS

39 SEC GLY EVAP TEMP OUT HIGH >50.5

1 ECS RAD OUT TEMP >43°? NO → 2 GLY EVAP OUT TEMP INST FAILURE

YES →

3 GLY EVAP STM PRESS <0.1 → 4 • SEC COOL LOOP EVAP – OFF (CENTER) • CHANGE J57 WITH J58 • SEC COOLANT LOOP EVAP = EVAP STM PRESS DECR TO NORMAL? >.15 YES → 5 J57 SENSOR FAILED

NO →

0.1–0.15

6 • ORIENT SC TO HEAT STM PRESS DUCT STM PRESS DECR TO NORMAL? NO → 7 SEC EVAP TEMP CONTROLLER FAILED OR BACKPRESS CONTROL VLV FAILED CLOSED OR FROZEN STM DUCT

YES →

8 STM PRESS DUCT TEMPORARILY FROZEN

9 SEC EVAP LOST UNLESS STM PRESS DECREASES <.15

3 → 10 ECS RAD OUT TEMP >97°? YES → ECS 35 1

NO →

11 • SEC COOL LOOP EVAP – RESET STM PRESS INCR? NO → 12 JAMMED STM PRESS CONTROL VALVE → 13 • DECREASE ELEC LOADS AND RECIRCULATE SC UNTIL EVAP TEMP DECREASES TO NORMAL

YES →

14 • SEC COOL LOOP EVAP – EVAP OFF • CHANGE J57 WITH J58 GLY EVAP OUT TEMP DECREASES? NO → 15 2.40 CONTROLLER FAILED OR FROZEN STM DUCT → 16 REDUCE ELEC LOADS TO KEEP EVAP OUT TEMP <60° AND RECIRCULATE SC FOR MAX COOLING

SEC COOLANT LOOP? EVAP – EVAP

YES →

17 J57 SENSOR FAILED

(1) →

18 • SEC COOL LOOP EVAP – RESET after 15 min • SEC COOL LOOP EVAP – EVAP STM PRESS STILL <0.1? NO → 21 EVAP WAS FROZEN

YES → 19 • SEC COOL LOOP EVAP – OFF • CHANGE J57 WITH J58 • SEC COOLANT LOOP EVAP – EVAP STM PRESS STILL <0.1? YES → 26 WATER CONTROL SECTION OF 2.40 CONTROLLER FAILED → 23 DECREASE ELEC LOADS – SEC EVAP LOST

NO → 22 EVAP SENSOR IN J57 FAILED

24 NOTE: If problem recurs, switch J57 with J58 and repeat step 18

14A panel 6 ? Y Room N 15 16 NO

(2) This may require considerable time

(1) Repetition of this Step may necessary

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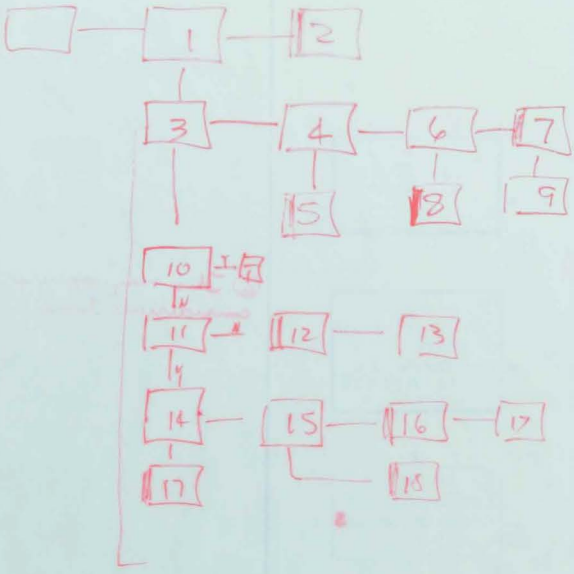
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SYMPTOM	PROCEDURE	REMARKS

40 SEC GLY EVAP OUT TEMP LOW
<40°F

1 SEC ECS RAD OUT TEMP?
40-98°

<40°F → ECS 341 SEC ECS RAD OUT TEMP LOW

>98°

2 SEC Cool Loop EVAP - RESET for 45 sec then OFF
STM PRESS INCR?
NO → 3 GLY EVAP OUT TEMP INSTRUMENTATION FAILURE
YES

4 SEC GLY EVAP OUT TEMP INCREASES?
NO → 5 DOUBLE FAILURE
YES → 12

6 SHUTDOWN SEC EVAPORATOR
• SEC Cool Loop EVAP - RESET (45 sec) then OFF
STM PRESS INCR?
NO → 7 STEAM PRESS CONTROL VALVE FAILURE → 8 CONTROL OF SEC GLY TEMP OUT BY BYPASSING SEC RADIATORS UNTIL EVAP OUT TEMP REACHES 60°
YES

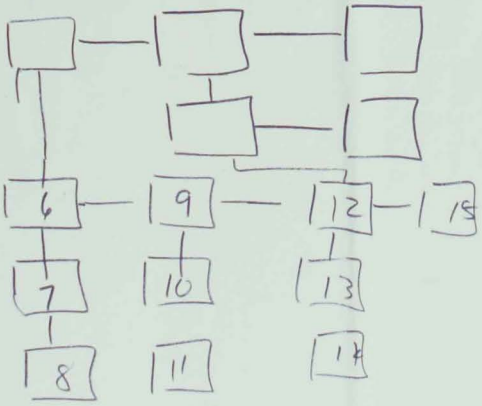
9 SEC GLY EVAP OUT TEMP INCREASES TO = RAD OUT TEMP?
NO → 10 INSTRUMENTATION FAILURE → 11 DEACTIVATE SEC EVAPORATOR
• SEC Cool Loop EVAP - EVAP
YES

a SEC COOLANT LOOP EVAP - OFF
12 CHANGE J57 WITH J58
• SEC Cool Loop EVAP - EVAP
SEC GLY EVAP OUT TEMP NORMAL?
NO → 13 GLY EVAP (240) CONTROLLER FAILED → 14 SOME MANUAL CONTROL OF THE SECONDARY EVAPORATOR MAY BE POSSIBLE BY USE OF SEC Cool Loop EVAP SWITCH
YES

15 J57 SENSOR FAILURE

SEC ECS RAD GMP

① Inlet SEC GLY EVAP OUT TEMP from ECS RAD Inlet Temp



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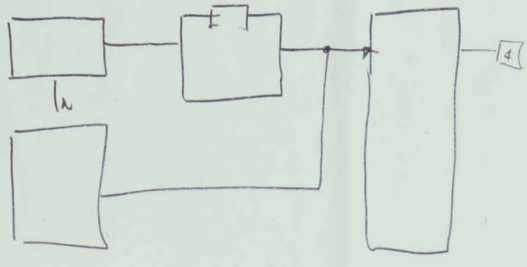
SYMPTOM	PROCEDURE	REMARKS
SSR #2 SECONDARY LOOP ACTIVATION	1 SIMULTANEOUS PRIMARY AND SEC HEAT LOAD? NO → 2 DEACTIVATE SEC COOLANT LOOP: • EVAP H2O CONT PRIM VLV – OFF • ECS RAD SEC HTR – OFF • GLY EVAP STM FLOW CONT VLV – AUTO • GLY EVAP STM PRESS INLET – INCR • ECS GLY PUMPS – OFF → 3 ACTIVATE SEC COOLANT LOOP: • ECS IND SEC HTR – ON → 4; • GLY TO RAD SEC VLV – BYPASS (4 required); • SEC COOLANT LOOP PUMPS – ON (4 required); • GLY DISCH SEC PRESS → 80 PSI; • ECS IND SEC HTR – OFF (4 required); • EVAP H2O CONT SEC VLV – AUTO; • SEC COOLANT LOOP – EVAP; • GLY EVAP SEC OUT TEMP – 40 → 50°F; • SEC SUIT HT EXCH VLV – FLOW (4 required) YES → Caution: FOR SIMULTANEOUS COOLANT LOOP OPERATION ONLY RADIATORS OF ONE COOLANT LOOP SHOULD BE USED. FOR LOOP BYPASSING RADIATOR: • GLY TO RAD VLV – BYPASS; • ECS RAD HTRS – OFF	(1) G&N USE AND CRITICAL CONDITIONS MUST BE COORDINATED ON SEC COOLANT LOOP. USAGE LIMITS FOR THIS EQUIPMENT IS AS FOLLOWS: 12 hr
3 → 4 IF A RETURN TO PRIMARY OPERATION IS DESIRED PROCEED AS FOLLOWS	5 DEACTIVATE SECONDARY LOOP: • ECS RAD SEC HTR – OFF; • SEC COOLANT LOOP EVAP H2O – RESET for 45 sec, TM to OFF (Stby); • SEC COOLANT LOOP PUMP – OFF; • EVAP H2O CONT SEC VLV – OFF → 6 ACTIVATE PRIMARY LOOP: • ECS IND HTR – ON; • GLY TO RAD PRIM VLV – NORMAL; • ECS GLY PUMPS – ACT; • GLY DISC PRIM PRESS – 40 PSI (>40 PSI); • ECS RAD PRIM HTR – PRIM; • GLY EVAP TEMP CONT – AUTO; • ECS H2O CONT PRIM VLV – AUTO; • GLY EVAP PRIM OUT TEMP – 40–50°F; • SUIT CAT HT EXCH – ON; • CABIN TEMP – AUTO	



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ECS

8 DEC 67

SYMPTOM	PROCEDURE	REMARKS

25 PRIM GLY ACCUM QTY HIGH > 70%

1 TRANSFER GLY TO [illegible]
- RSVR ACCUM FILL VLV – CLOSE
- GLY RSVR IN VLV – OPEN THEN CLOSE

NOTE: GLY RSVR IN VLV SHOULD BE RAPIDLY CRACKED OPEN & THEN CLOSED [illegible]

DECREASES TO NORMAL

NO → 2 GLY ACCUM QTY INDICATOR FAILURE

YES ↓

3 GLY ACCUM QTY INCR AGAIN ?

YES → 4 RSVR ACCUM FILL VALVE LEAKING

NO ↓

5 TRANSIENT CONDITION CAUSED INCREASE IN ACCUM QTY

6 STATUS O.K.
- REPEAT STEP 1 AS NECESSARY IF LEAK RATE IS HIGH
- PRIM ACCUM FILL VLV – ON

12/18/67 JS

NAA number 30, pt, Amdt

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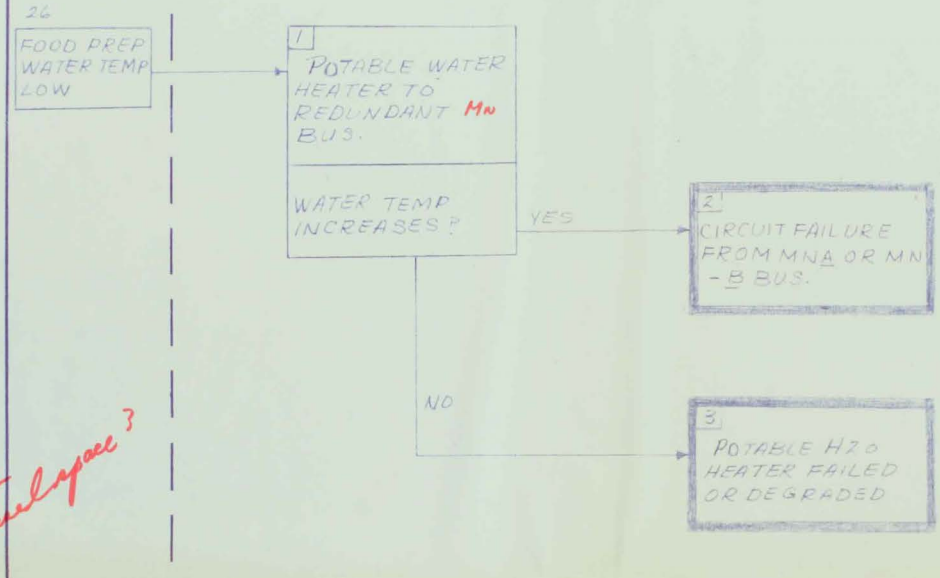
SWIGERT 12/12

SYMPTOM	PROCEDURE	REMARKS



12/12 to MMA review 12/13/67

how about unused space ?

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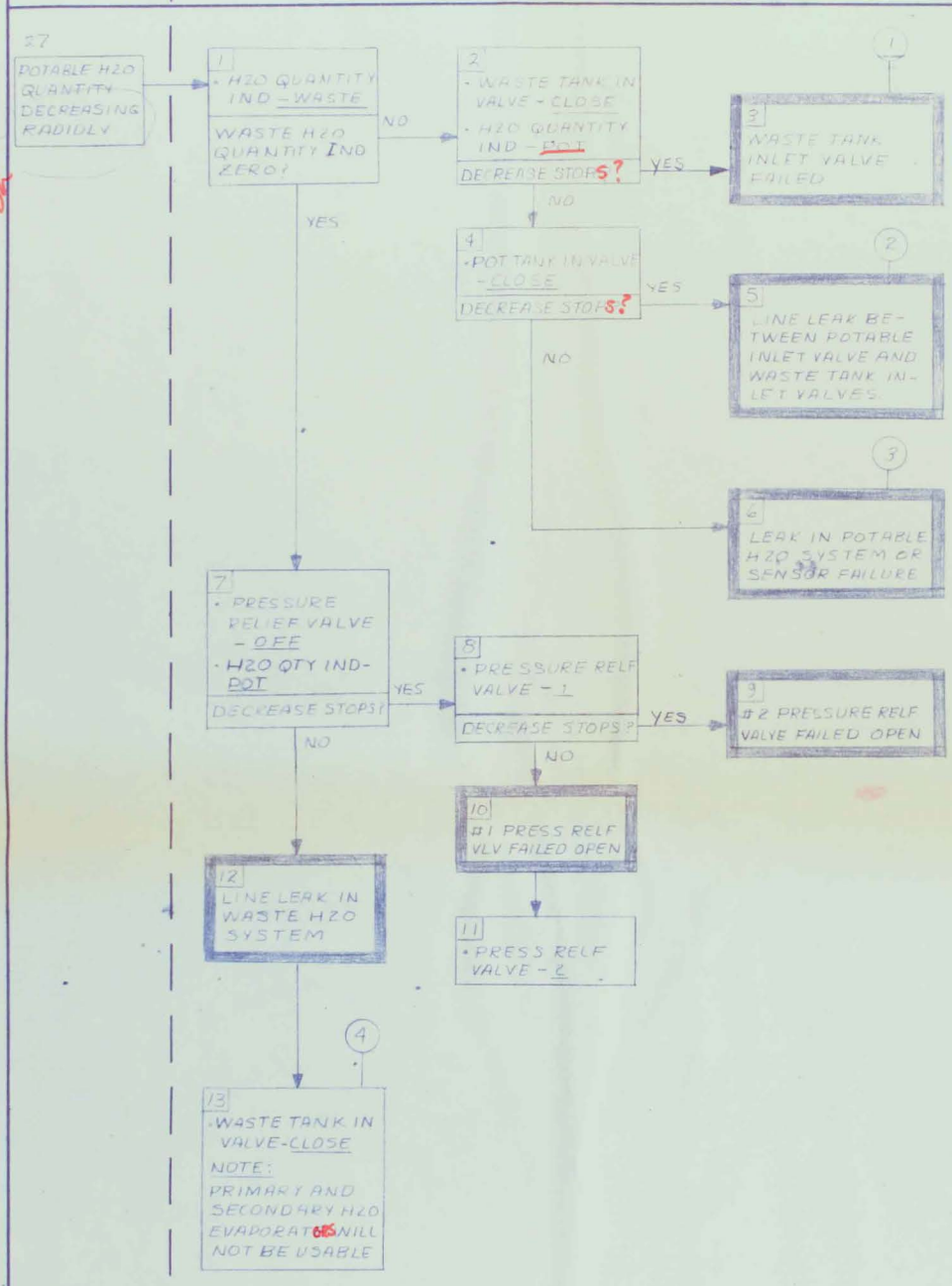
SYMPTOM	PROCEDURE	REMARKS



(1) THIS FAILURE IS NOT SERIOUS AND WILL RESULT IN APPROXIMATELY EQUAL QUANTITIES BEING MAINTAINED IN POTABLE AND WASTE WATER TANKS.

(2) INCOMING FUEL CELL WATER WILL STILL PASS THRU THIS LEAK.

(3) REMAINING WATER IN POTABLE TANK MAYBE SAVED BY TURNING THE H2O/GLY TANK PRESSURE – REGULATOR VALVE – OFF.

(4) H2O EVAPORATORS CAN BE USED BY PERIODICALLY OPENING THE WASTE TANK INLET VALVE FOR APPROXIMATELY 2 – 3 MINUTES UNTIL THE EVAPORATOR WICKS ARE SATURATED. H2O LINE LEAKAGE WILL OCCUR DURING THESE PERIODS

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SYMPTOM	PROCEDURE	REMARKS

27A

WASTE H2O QUANTITY DECREASING RAPIDLY

1
• PRESSURE RELF VALVE - OFF
DECREASE STOPS ?

NO

2
LINE LEAKAGE IN THE WASTE H2O SYSTEM OR SENSOR FAILURE

YES

3
• PRESSURE RELF VALVE - 1
DECREASE STOPS ?

YES

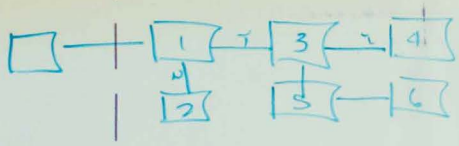
4
#2 H2O CONTROL PRESS RELF VLV FAILED OPEN

NO

5
#1 H2O CONTROL PRESS RELF VLV FAILED OPEN

6
• PRESS RELF VALVE - 2

1 MONITOR CABIN HUMIDITY. CHECK FOR WATER IN COMMAND MODULE



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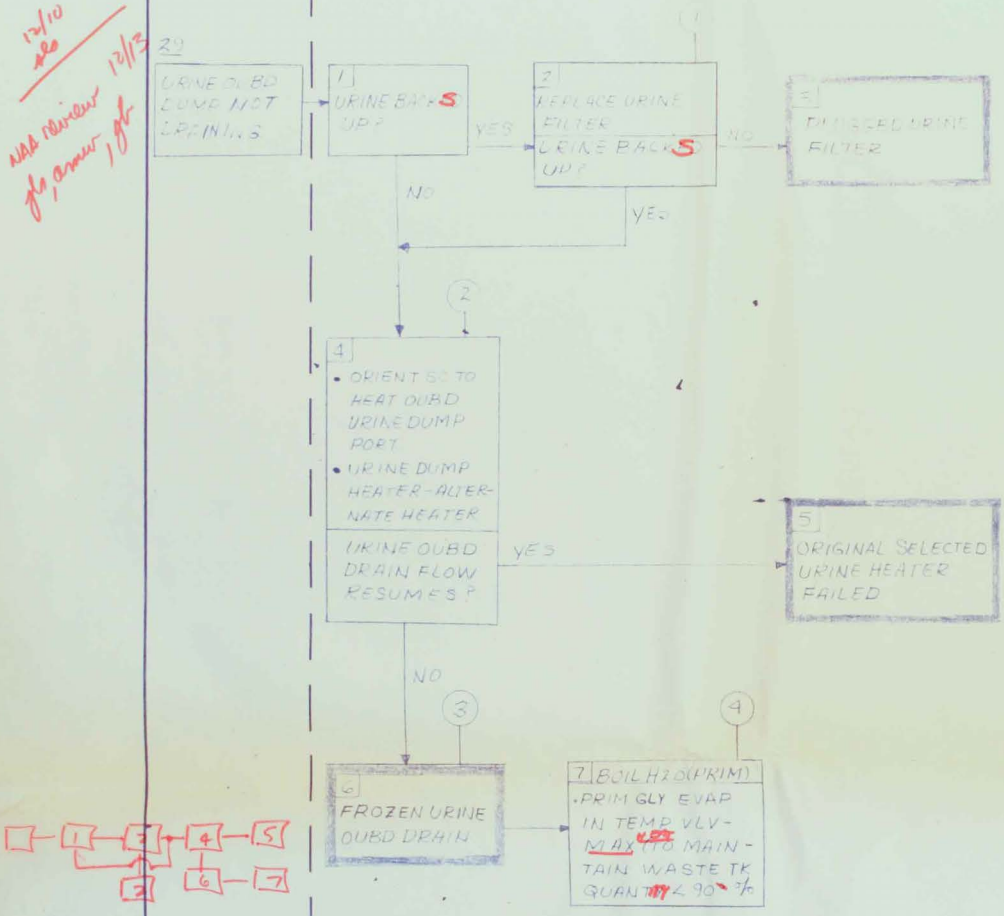
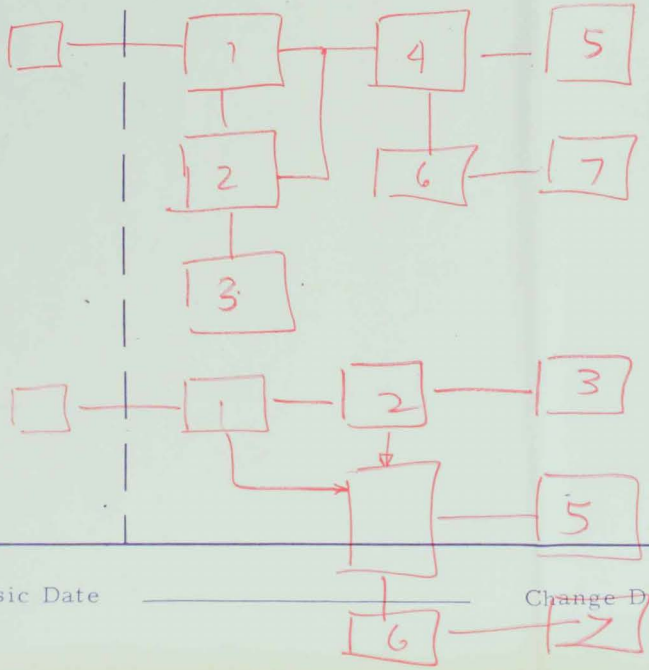
SYMPTOM	PROCEDURE	REMARKS





(1) USE FILTER ASSOCIATED WITH EITHER VACUUM CLEANER OR FECAL CANISTER.

(2) ALLOW TIME FOR URINE TID HEATER OPERATION ORIENT SC FOR MAXIMUM EXTERNAL HEAT ON URINE DUMP NOZZLE IN ATTEMPT TO CLEAR PROBABLE ICE BLOCK. PROBABILITY OF SUCCESS VERY LOW.

(3) BATTERY VENT, FECAL CANISTER, VACUUM CLEANER, FECAL STORAGE VENT, WATER TANKS H2 AND O2 BLEED, AND WATER DUMP CAPABILITY LOST.

(4) LOSS OF WATER DUMP CAPABILITY WILL RESULT IN OVERPRESSURIZATION OF WATER SYSTEM, IF WASTE TANK IS FULL AND LOSS OF FUEL CELLS IF WASTE AND POTABLE TANKS ARE FULL.
EXCESSIVE MANUAL CONTROL IN MAX HEAT (CCW) MIGHT RESULT IN PARTIAL RADIATOR FREEZING.

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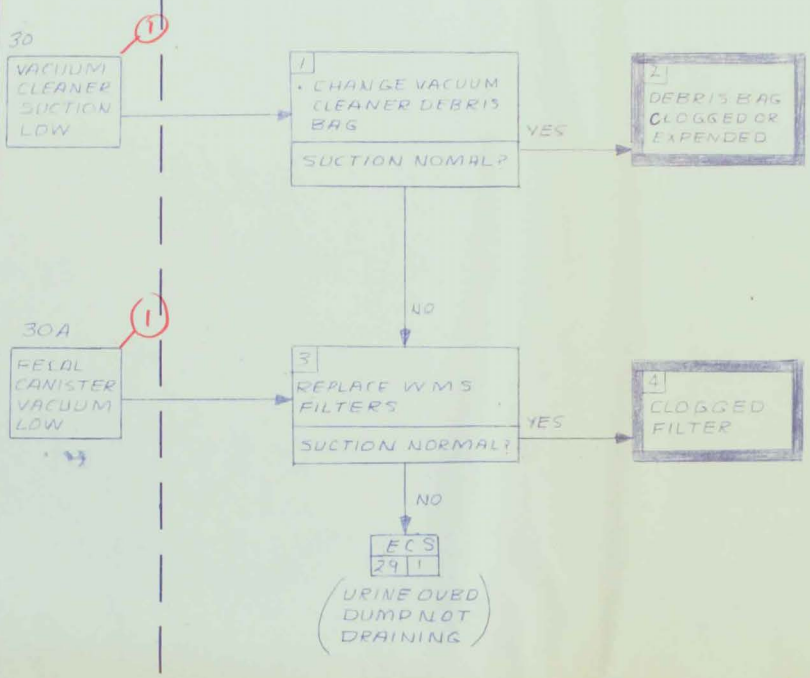
SYMPTOM	PROCEDURE	REMARKS



(1) Assumes second Waste Management System has disengaged

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SYMPTOM	PROCEDURE	REMARKS

32 INADEQUATE VENTILATION AFTER LANDING

1 CYCLE POST LANDING VENT SWITCH
VENTILATION INCREASES? — YES → 2 RESETS ATTITUDE SENSOR RELAY TO RESUME FAN OPERATION

NO → 3 ACTUATE-PLVC
• PLVC - OPEN
VENTILATION INCREASES? — YES → 4 ATTITUDE SENSING SWITCHED FAILED CLOSED

NO → 5 POST LANDING BLOWER FAILURE

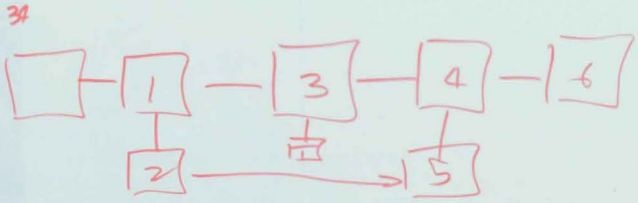
1 POSTLANDING VENT SWITCH MUST BE CYCLED TO OFF AND BACK TO HIGH (LOW) ANY TIME SC ATTITUDE EXCEEDS 60° TO RESET THE ATTITUDE CONTROL RELAY

33 WATER IN-FLOW AFTER LANDING

1 • PLVC SW - NORMAL
WATER IN FLOW STOPS? — YES → 2 PLV GATE VALVE OPEN

NO → 3 • PL VENT SW - OFF
• CABIN PRESS RELIEF V1 V(2) - CLOSE
WATER IN FLOW STOPS? — YES → 4 ATTITUDE SENSING SWITCH FAILED OPEN

NO → 5 UNCONTROLLABLE WATER INFLOW INTO SPACECRAFT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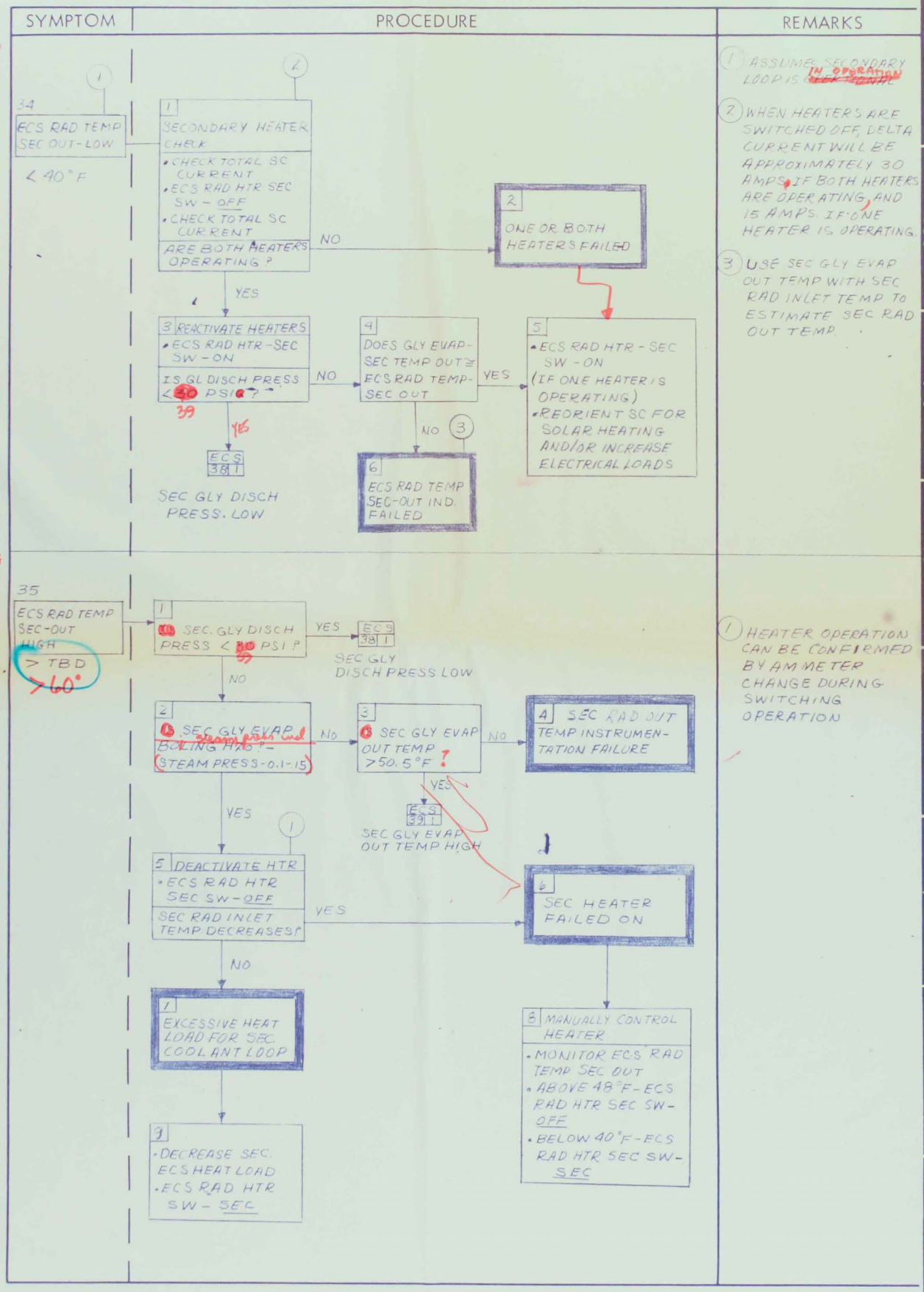

SYMPTOM	PROCEDURE	REMARKS
1 36 SEC GLY ACCUM QTY DECREASING	1 ISOLATE POSSIBLE LEAKS • ECS RAD SEC HTR - OFF • GLY TO RAD SEC VLV - BYPASS • SUIT HT EXCH SEC GLY VLV - BYPASS NOTE: BYPASS OPERATION > 15 MIN. CAN LEAD TO RADIATOR FREEZING GLY ACCUM QTY STABILIZED ? NO → 2 SEC COOLANT LOOP PUMP - OFF (CONSIDER) IS GLY DISCH SEC PRESS COMPATIBLE FOR INDICATED GLY ACCUM QTY ? NO → 3 GLY ACCUM QTY INSTRUMENTATION FAILURE YES → 4 LEAK IN SYSTEM (CANNOT BE ISOLATED) YES → 5 REACTIVATE • SEC COOLANT LOOP PUMP AC 1 (AC 2) (if req'd) • ECS RAD SEC HTR - SEC (if req'd) • GLY TO RAD SEC VLV - NORMAL • SUIT HT EXCH SEC GLY VLV - FLOW	(1) THIS SYMPTOM IS VALID WHEN SECONDARY GLYCOL LOOP IS NOT IN OPERATION. (NORMAL RANGE 30 % - 70 %) also (3) with pump off gly leakage flow should equal 1/4 gly accum qty.
8 REACTIVATE RADIATOR • ECS RAD SEC HTR - SEC (if req'd) • GLY TO RAD SEC VLV - NORMAL GLY ACCUM QTY STABILIZED ? NO → 6 LEAKAGE IN RADIATOR SYSTEM → 7 ISOLATE RAD • ECS RAD SEC HTR - OFF • GLY TO RAD SEC VLV - BYPASS • REDUCE C/M ELECTRICAL LOADS YES → 9 LEAK IN SUIT HT EXCH → 10 KEEP SUIT HT EXCH SEC GLY VLV ISOLATED EXCEPT JUST PRIOR TO O_2 AND UMBIL - ENTRY TO CONSERVE COOLANT		REACTIVATE SUIT HT EXCH ONLY WHEN NECESSARY AND PRIOR TO ENTRY IN ORDER TO CONSERVE WATER

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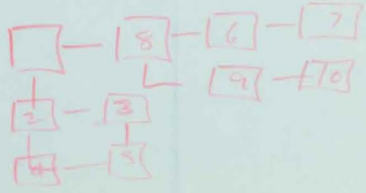
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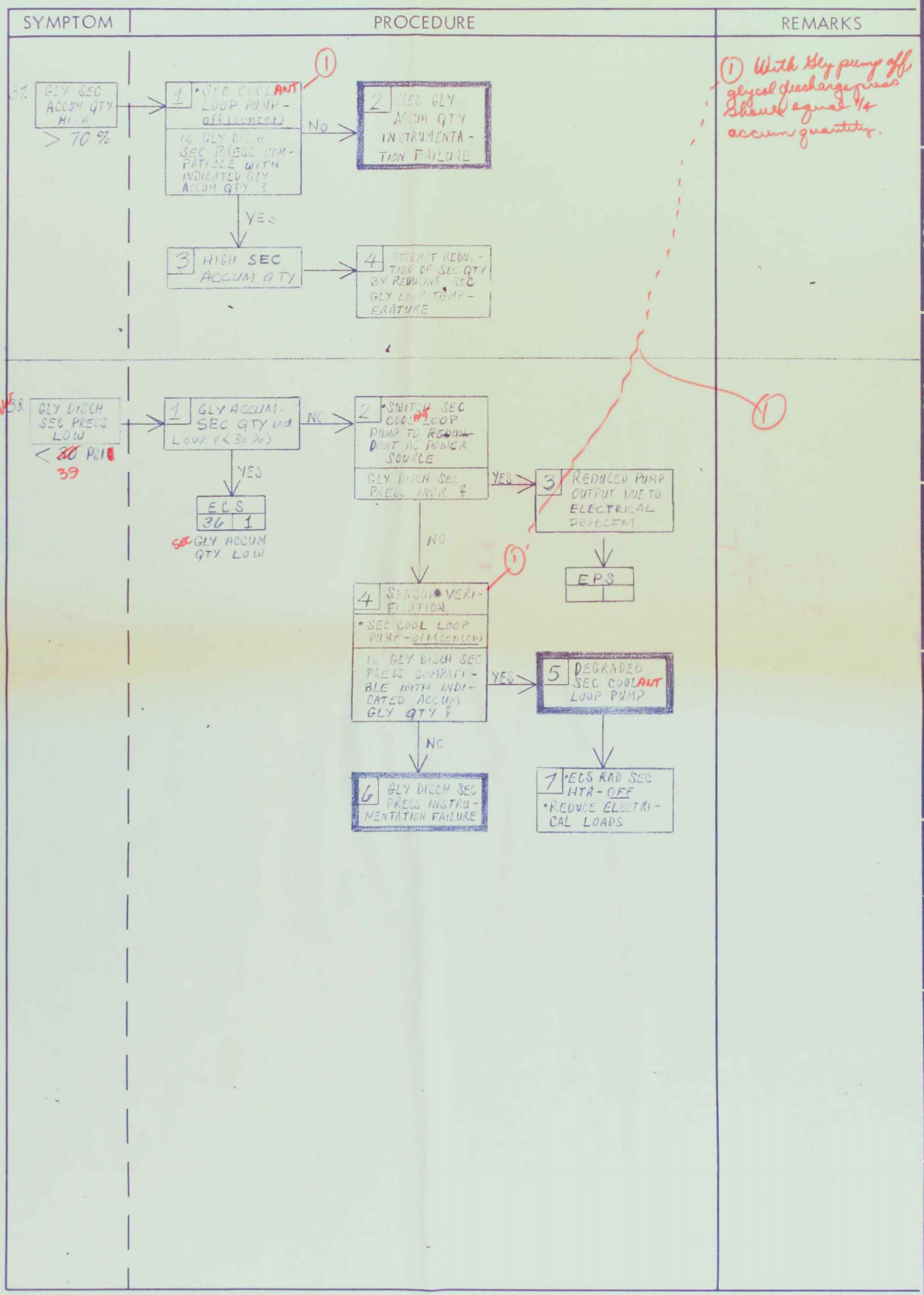

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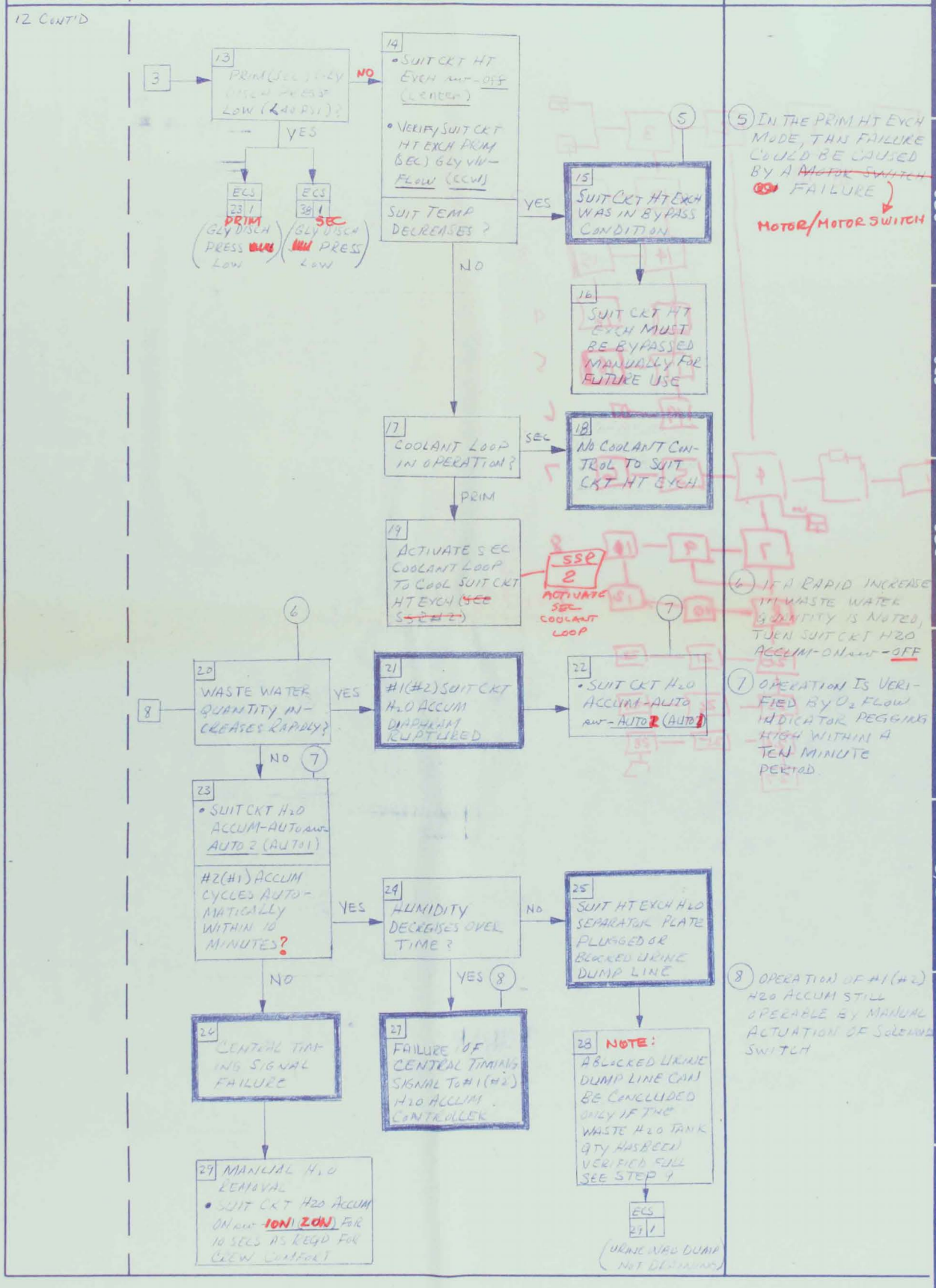

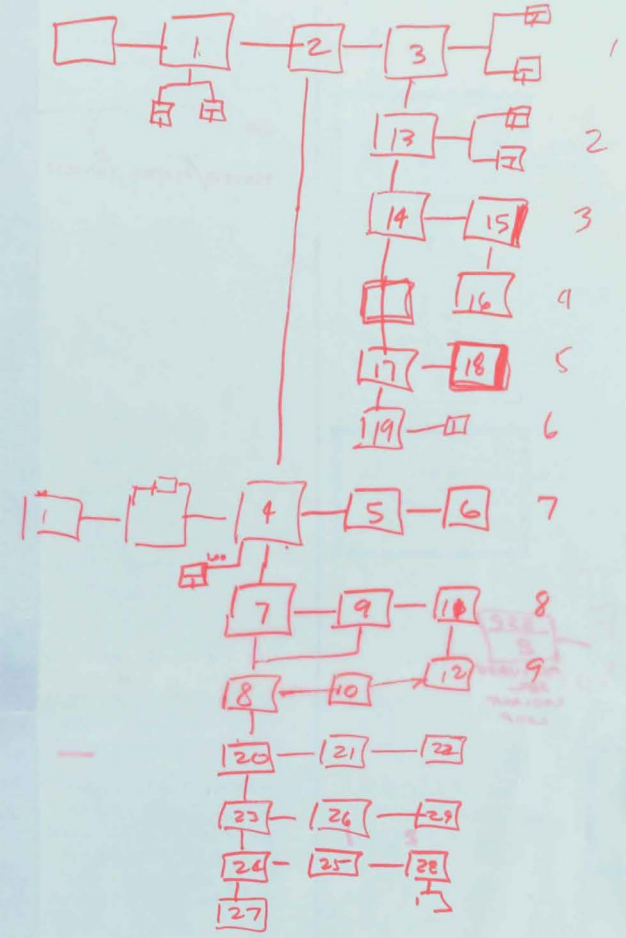
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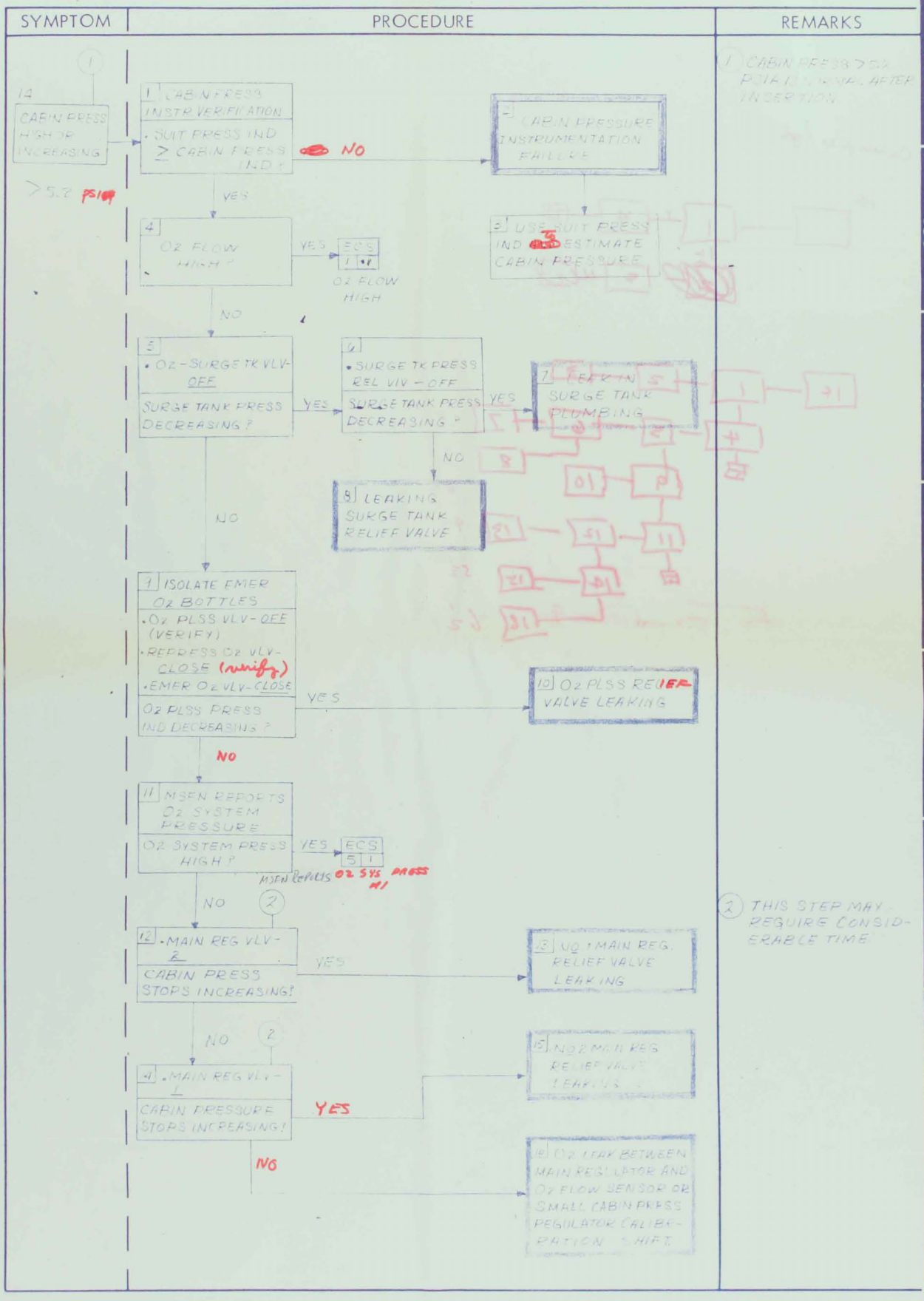

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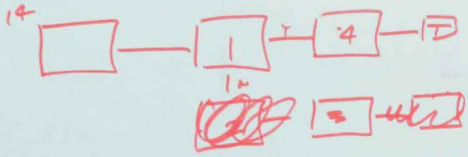
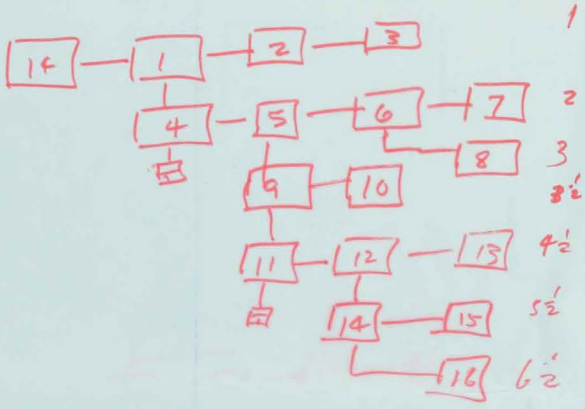
Column press high





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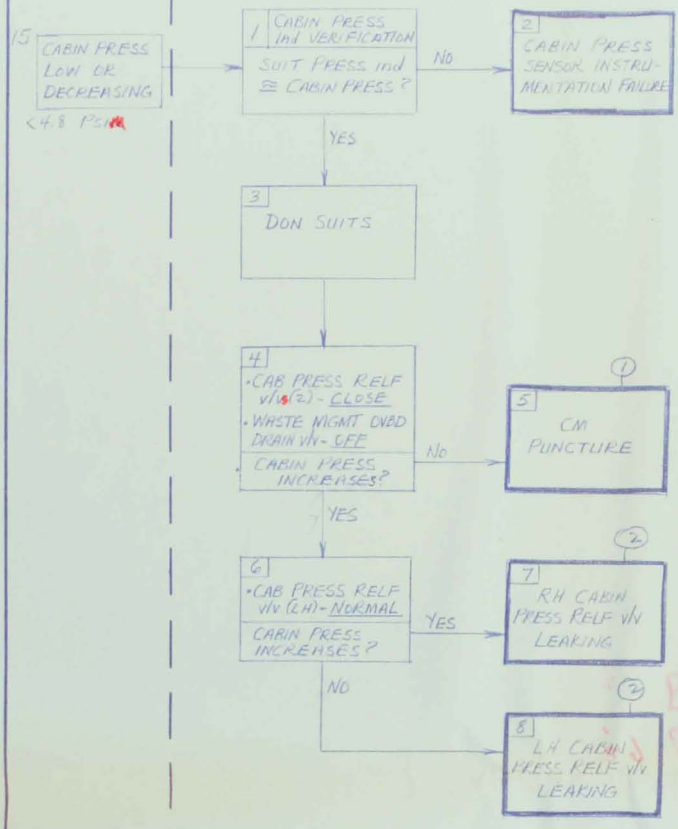

① Maintain fully suited mode. Excessive O_2 consumption if Cabin Press maintained

② Maintain close position on leaking valve. Cabin press Relief Valve redundancy lost

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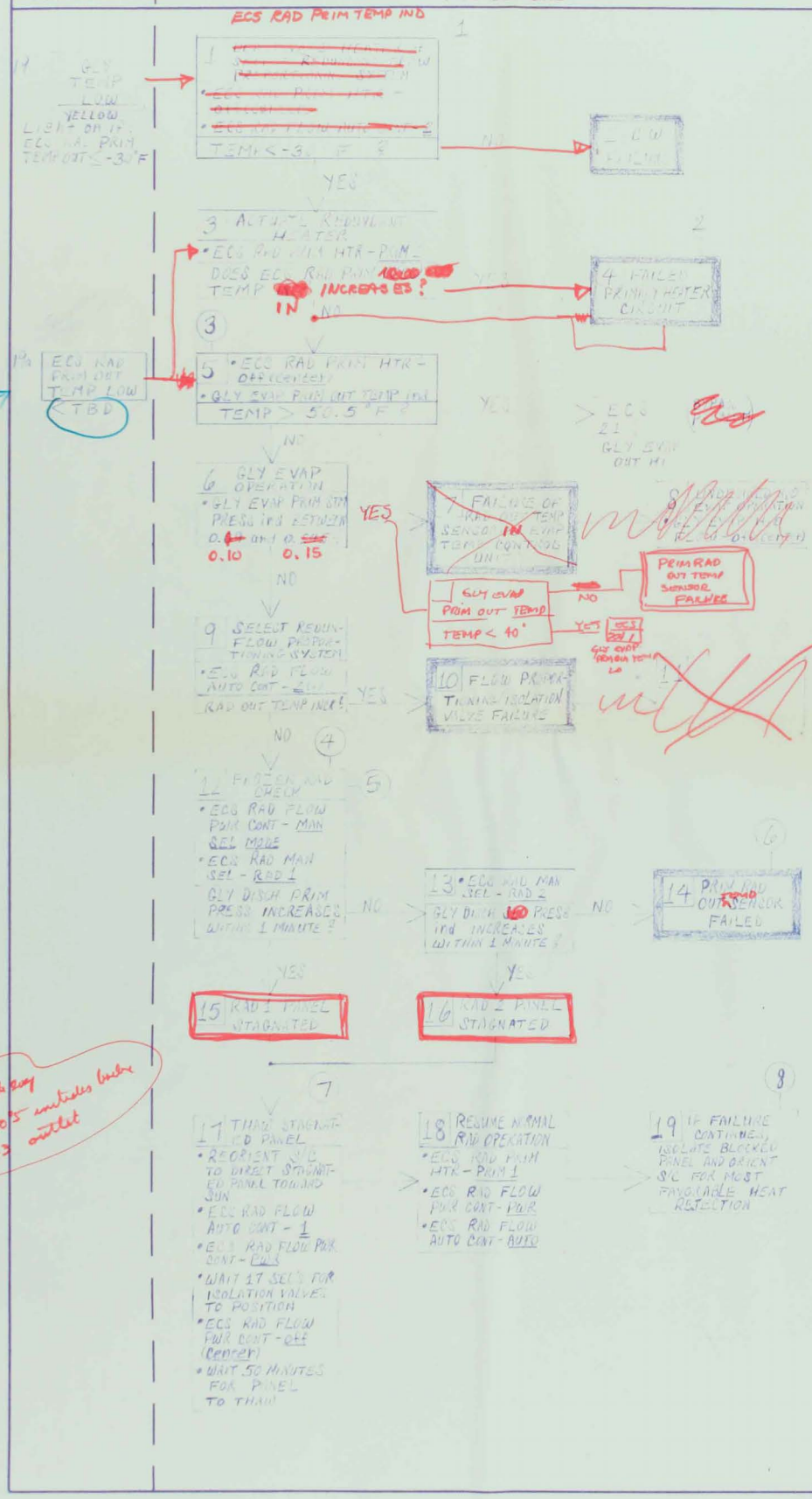
SYMPTOM	PROCEDURE	REMARKS



1. BECAUSE OF THERMAL CONSTANTS INVOLVED THERE WOULD BE TIME TO VERIFY ECS RAD OUT TEMP WITH MSFN AS THE RAD TEMP WAS DROPPING

2. CONTINUE TROUBLE SHOOTING - HEATER FAILURE MAY NOT BE ONLY FAILURE. TURN HEATERS OFF FOR TROUBLESHOOTING AFTER SUFF RAD OPERATING TEMP EXISTS

3. HEATER IS SHUT OFF FOR TROUBLESHOOTING AND TO AVOID POSSIBILITY, WITH LOW FLOW, OF BOILING H_2O/GLY IN LINE.

4. MSFN CAN AID IN DETERMINING FROZEN/STAGNATED PANEL BY TM'd PRIM RAD BAY TEMP OUT MEASUREMENTS AND PRIM GLYCOL FLOW RATE.

5. IF GLY DISCH PRESS < 40 PSI PROCEED TO ECS 7.3.1

6. ABSENCE OF H.O BOILING AND NORMAL PRIM RAD INLET TEMP ONLY INDICATION OF PRIM RAD OUT TEMP.

7. THIS THAWING PROCEDURE MAY BE EXPEDITED BY ACTIVATING THE SECONDARY COOLANT LOOP. Panel 1 is located between +4 and +2 axis. Panel 2 is located between -4 and -2 axis.

8. BLOCKAGE OF RAD FLOW CANNOT BE DISTINGUISHED FROM A STAGNATED PANEL. SINGLE PANEL IS LESS EFFECTIVE: ELECTRICAL LOADS SHOULD BE REDUCED.

12/10/67 file MAA Reviewer file

TBD

Running water 95° in & Ray 240 cont - 98% 50°F outside tube 90 & 93 outlet

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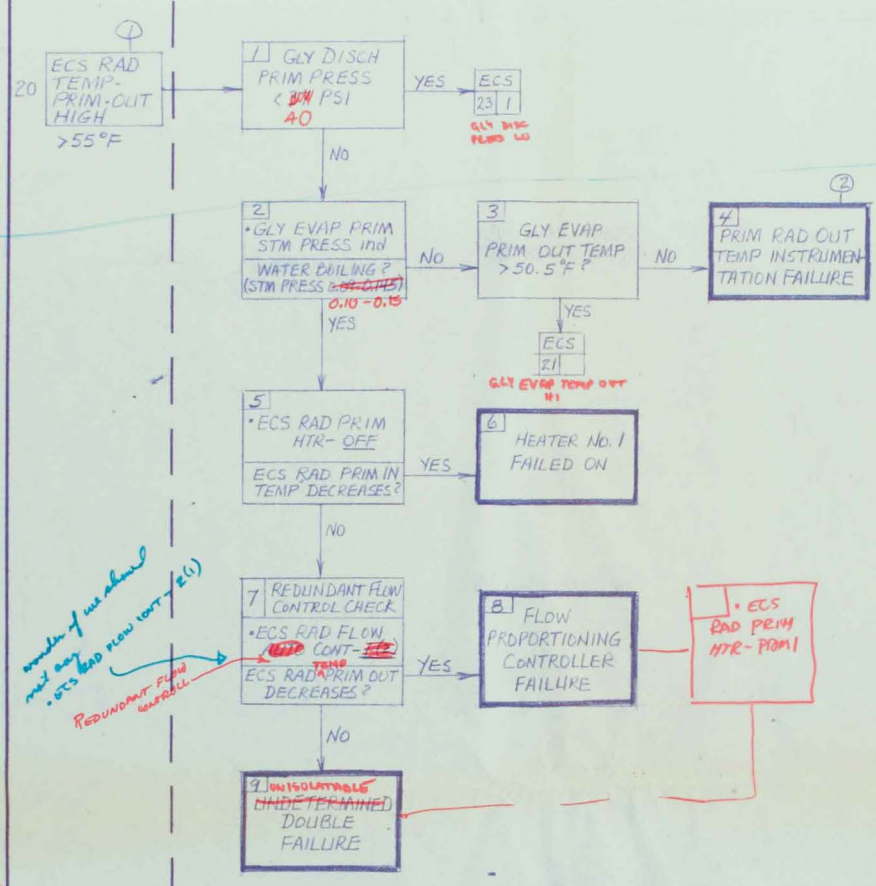
SYMPTOM	PROCEDURE	REMARKS



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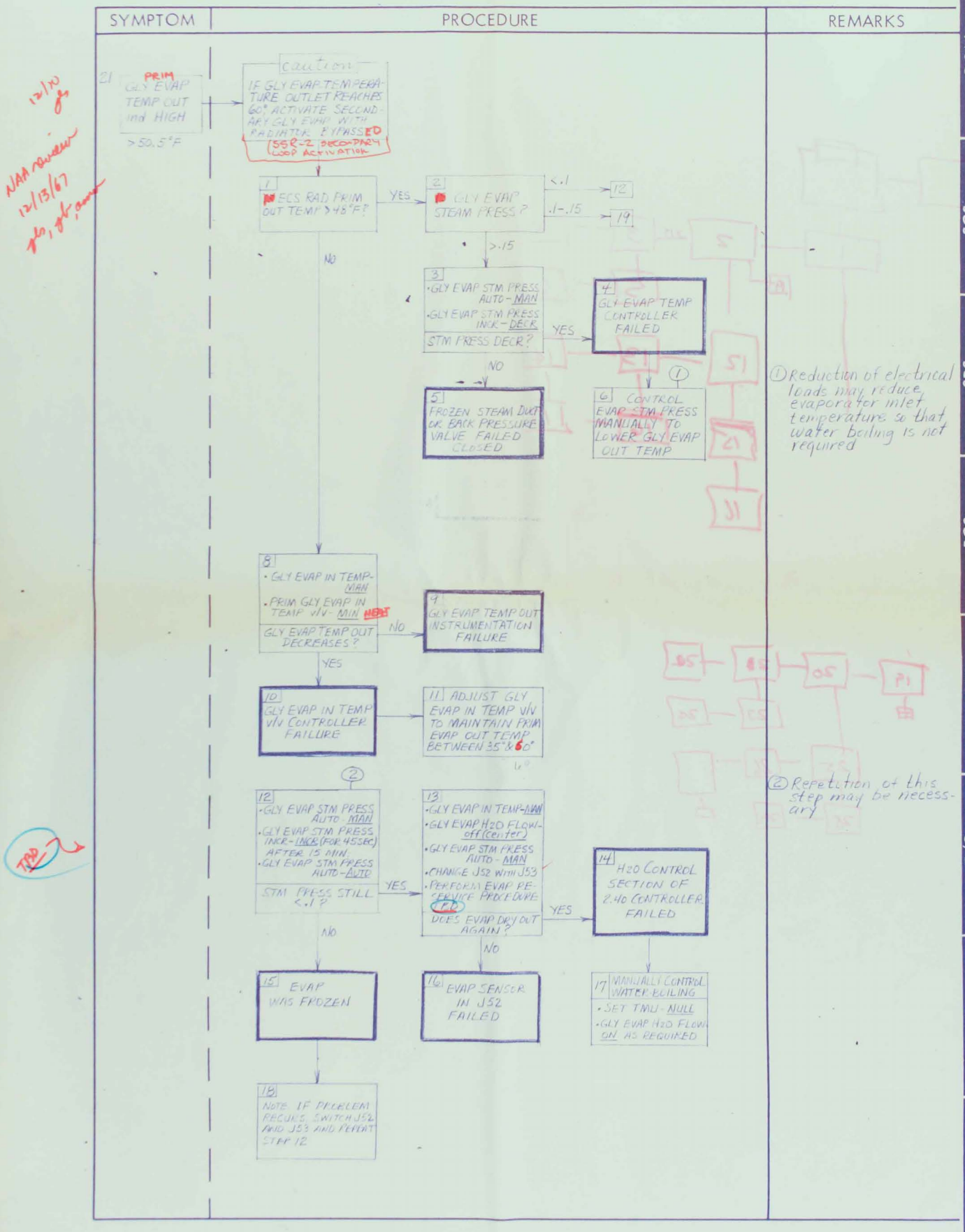

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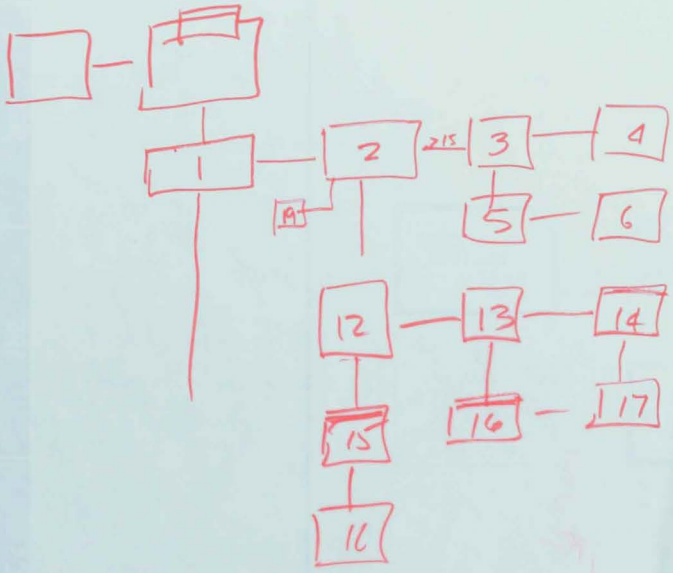
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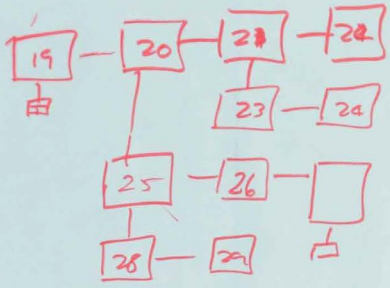
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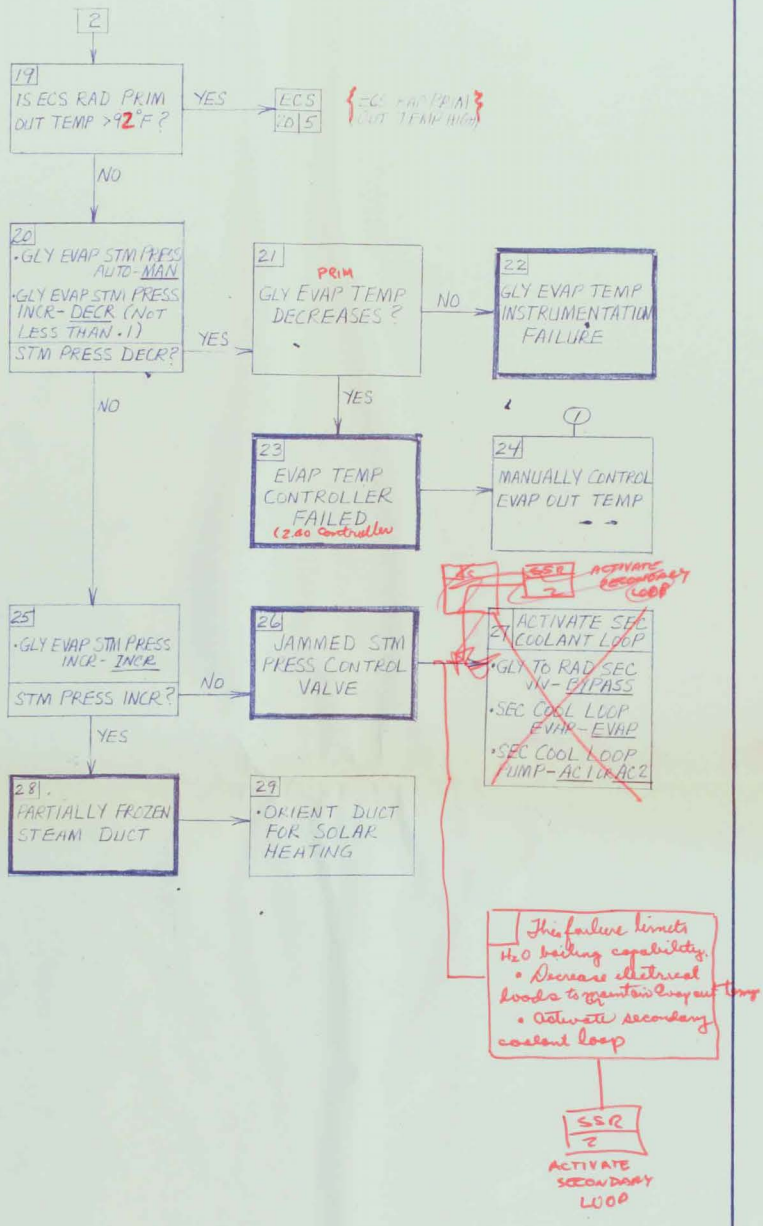
SYMPTOM	PROCEDURE	REMARKS

21 (cont.)

12/10/67 gh OK NAR reviewed for JSC

change from 97 to 92 due to increased flow rates (210 cc/min to 240 cc/min)



ADMIN - 167 Expires 9-15-67

SYMPTOM	PROCEDURE	REMARKS

22 GLY EVAP PRIM OUT TEMP Ind Low
<40°F

1 ECS RAD PRIM OUT TEMP <48°?
- No → 2
- YES → 5

2 SHUTDOWN PRIM EVAP
- GLY EVAP STM PRESS AUTO - MAN
- GLY EVAP STM PRESS INCR - INCR FOR 45 SEC
- STEAM PRESS INCREASES > .16?
  - No → 3
  - YES → 4

3 STEAM PRESSURE CONTROL VALVE FAILURE

4
- EVAP H2O CONT PRIM VLV - OFF
- ACTIVATE SECONDARY GLY EVAP with radiators by-passed
- ~~SEC COOL LOOP EVAP EVAP~~
- ~~SEC COOL LOOP PUMP ACT & AC 2~~

350 sec Log actuation

5 DOES GLY EVAP PRIM OUT TEMP INCREASE TO ≈ PRIM RAD OUT TEMP?
- No → 6
- YES → 7

6 PRIM GLY EVAP TEMP INSTRUMENTATION FAILURE → 1

7 CHANGE CONNECTOR J52 WITH J53
- GLY EVAP H2O FLOW off (center)
- GLY EVAP STM PRESS AUTO - MAN
- CHANGE J52 WITH J53
- GLY EVAP STM PRESS AUTO - AUTO

GLY EVAP OUT TEMP NORMAL (40-50.5°)?
- YES → 9
- No → 10

8 REACTIVATE PRIM EVAP
- GLY EVAP STM PRESS AUTO - AUTO

9 J52 SENSOR FAILURE

10 GLY EVAP CONTROLLER (2.4Ω CONTROLLER) FAILED → 11

11 MANUALLY CONTROL EVAPORATOR
- GLY EVAP STM PRESS AUTO - MAN
- GLY EVAP STM PRESS INCR - INCR (AS REQ'D)

12
- GLY EVAP STM PRESS AUTO - MAN
- GLY EVAP STM PRESS INCR - INCR FOR 45 SEC

STEAM PRESS INCREASES?
- YES → 13
- NO → 15

13 GLY EVAP TEMP OUT INCREASES?
- YES → 7
- NO → 14

DOUBLE FAILURE

14 (~~240 CONTROLLER~~ & INSTRUMENTATION OR ~~H2O BOILER~~ 240 CONTROLLER & MIXING VALVE FAILURE)

15
- PRIM GLY EVAP IN TEMP VLV - MAX HEAT

GLY EVAP TEMP OUT INCREASES?
- YES → 16
- No → 18

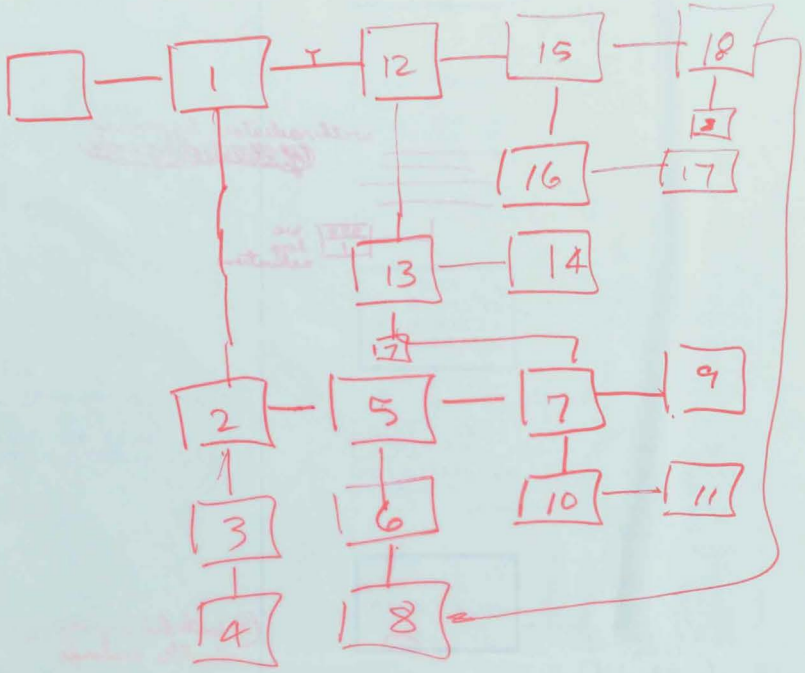
16 GLY EVAP TEMP IN CONTROLLER FAILURE → 17

17 MANUALLY CONTROL GLY EVAP TEMP OUT BETWEEN 35°-60° BY ADJUSTING PRIM GLY EVAP IN TEMP VALVE

18 GLY EVAP TEMP OUT INSTRUMENTATION FAILURE → 8

① Proper operation of the Glycol Evap must be obtained from MSFN and PRIM RAD Inlet Temp

Basic Date _____ Change Date 11/27/67 Page _____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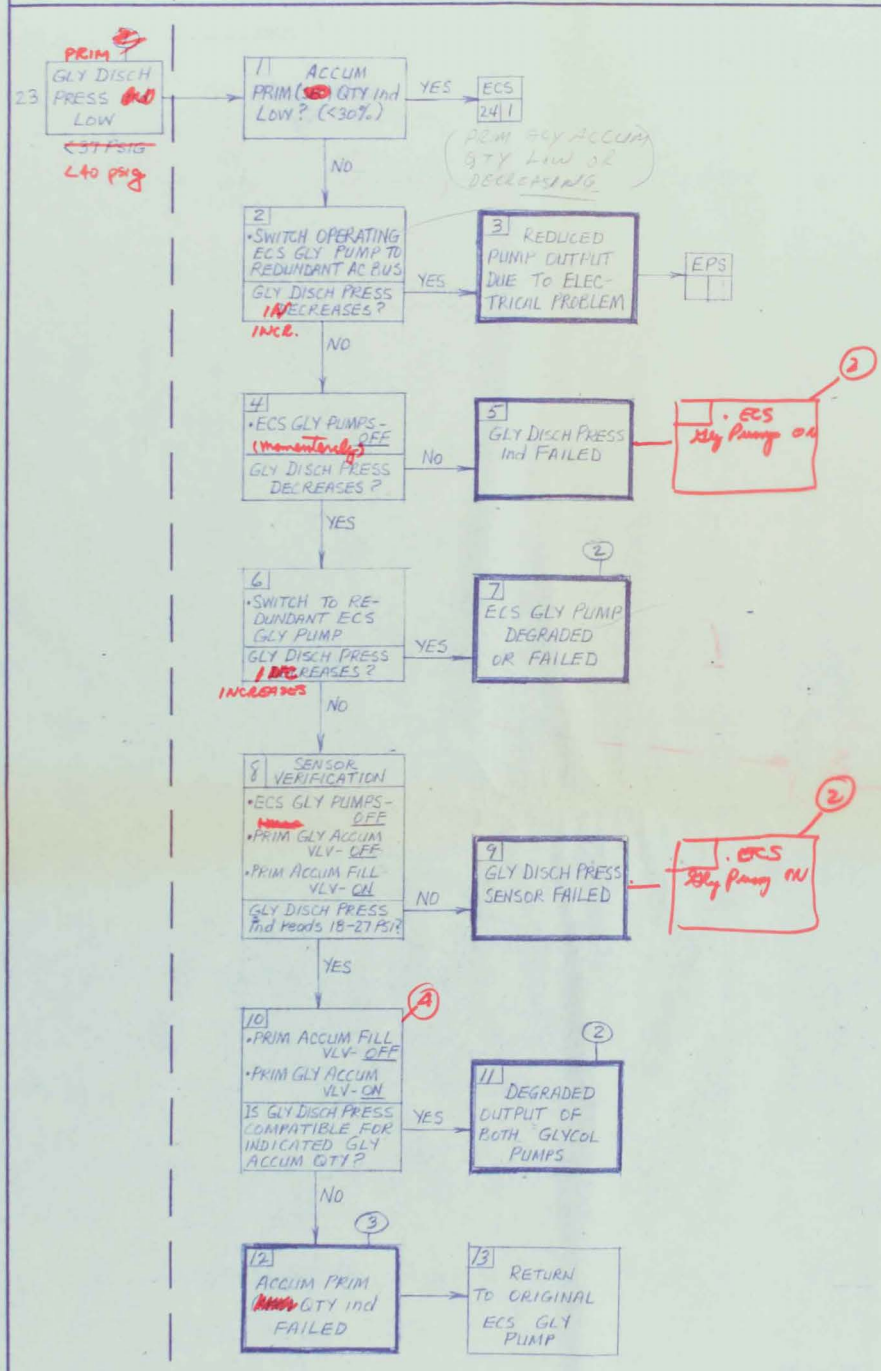
SYMPTOM	PROCEDURE	REMARKS



(1) 20< P < 37 - LEAK PROBLEM
10 < P < 20 - PUMP PROBLEM
P < 10 - PUMP & LEAK
P > 0 - SENSOR PROBLEM

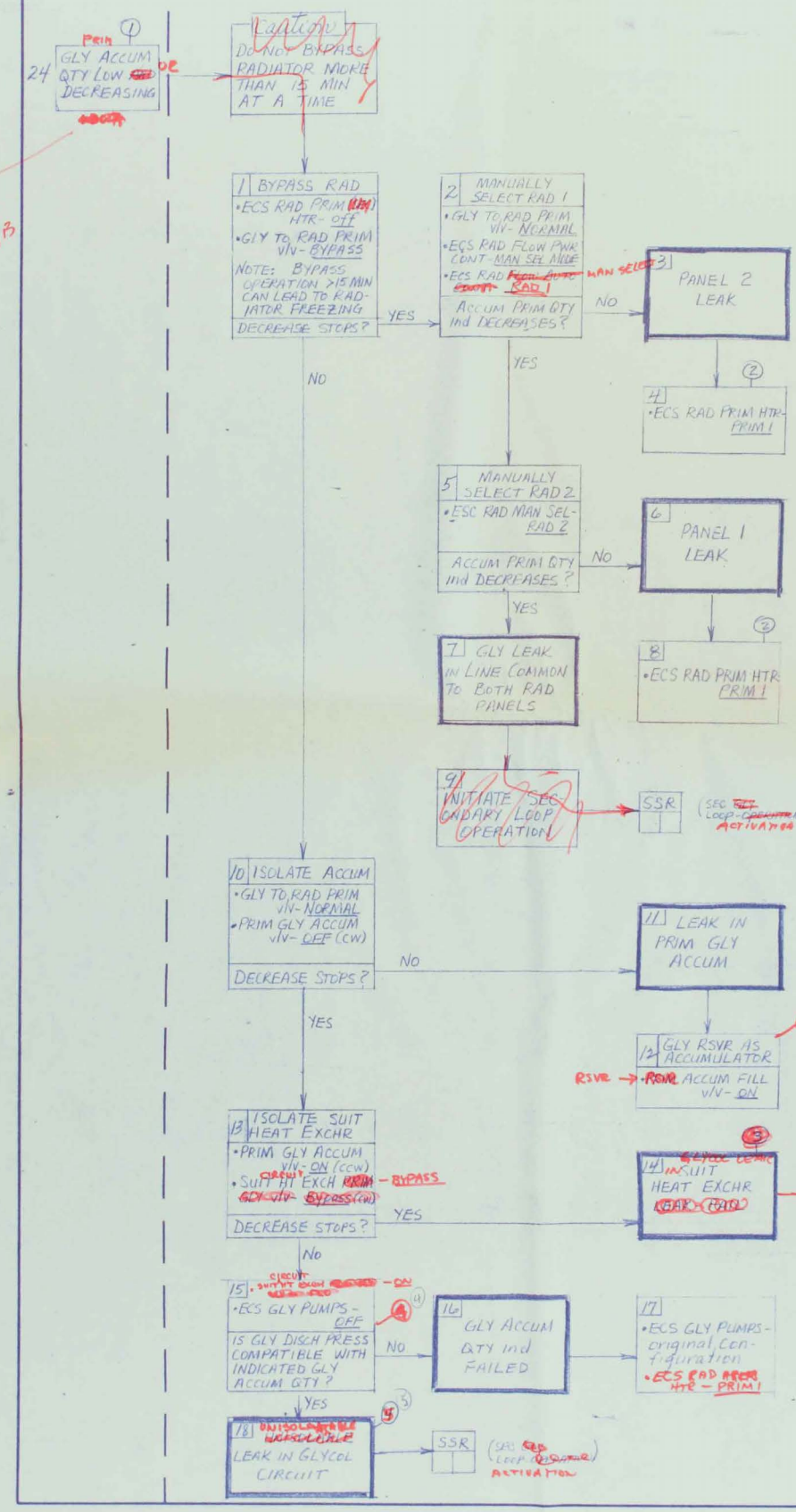
(2) Degraded Glycol pump may be verified by checking GLY PRIM COLDPLATE Flow rate with MSFN

(3) with ECS Glycol pump off, Gly discharge pressure should equal 1/4 Accum Qty Indication

(3) Glycol Accum Qty Indication may be estimated by Glycol Disch Press reading with ECS GLY PUMPS OFF

G&N MALFUNCTION
SCS MALFUNCTION
SPS MALFUNCTION
RCS MALFUNCTION
EPS MALFUNCTION
T/C MALFUNCTION
ECS MALFUNCTION
SEQ MALFUNCTION

SYMPTOM	PROCEDURE	REMARKS



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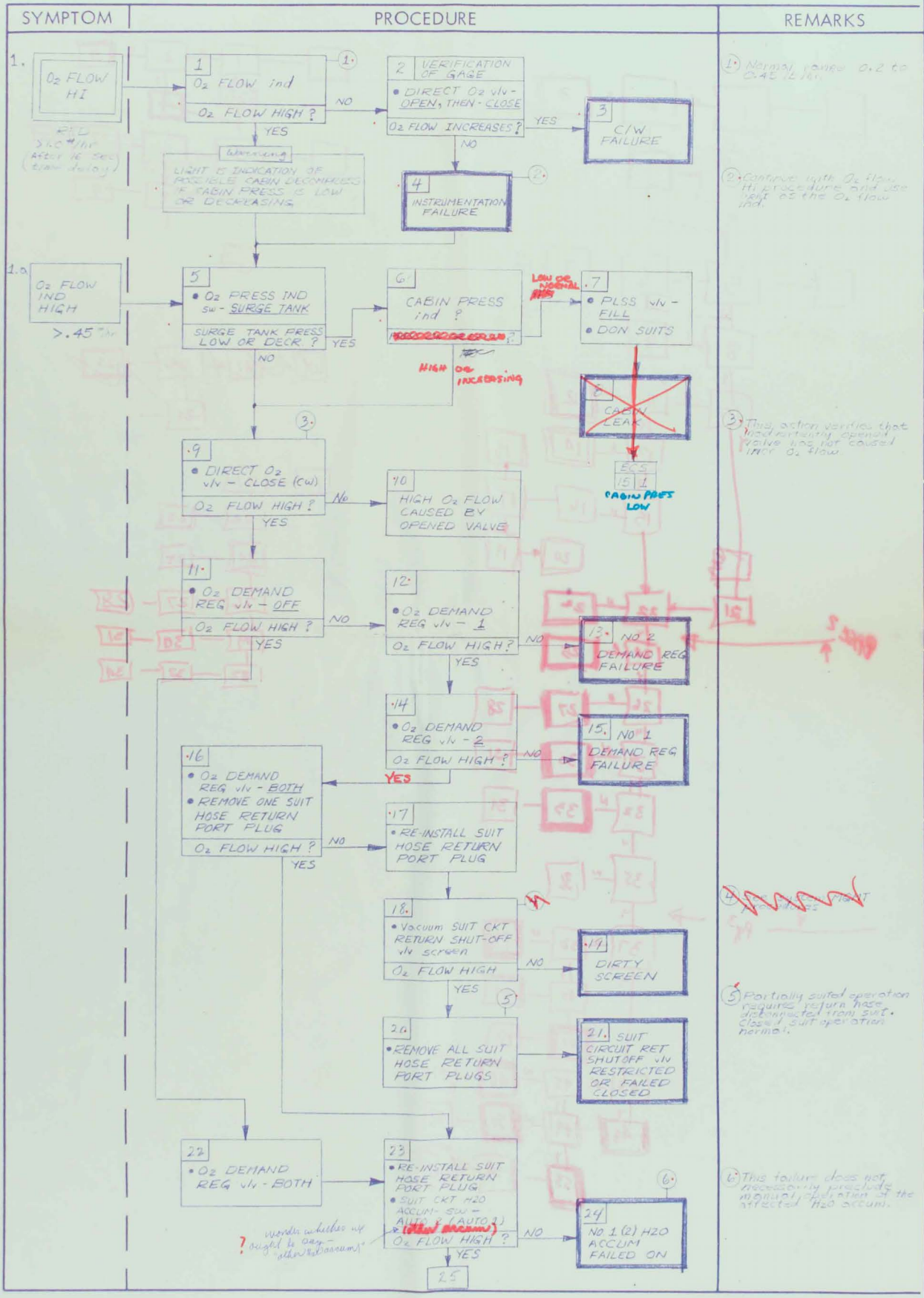

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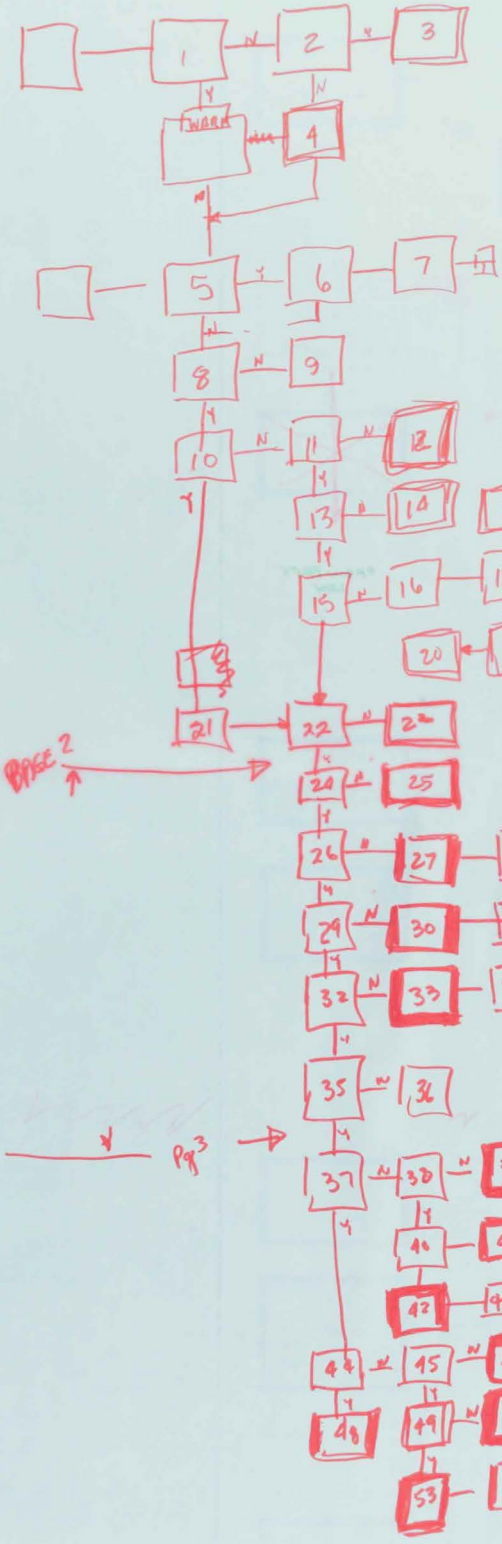
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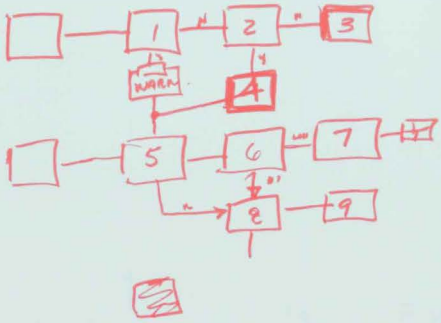
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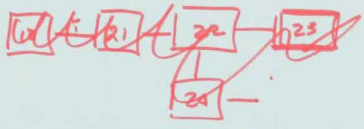
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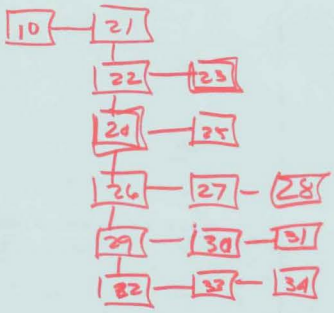
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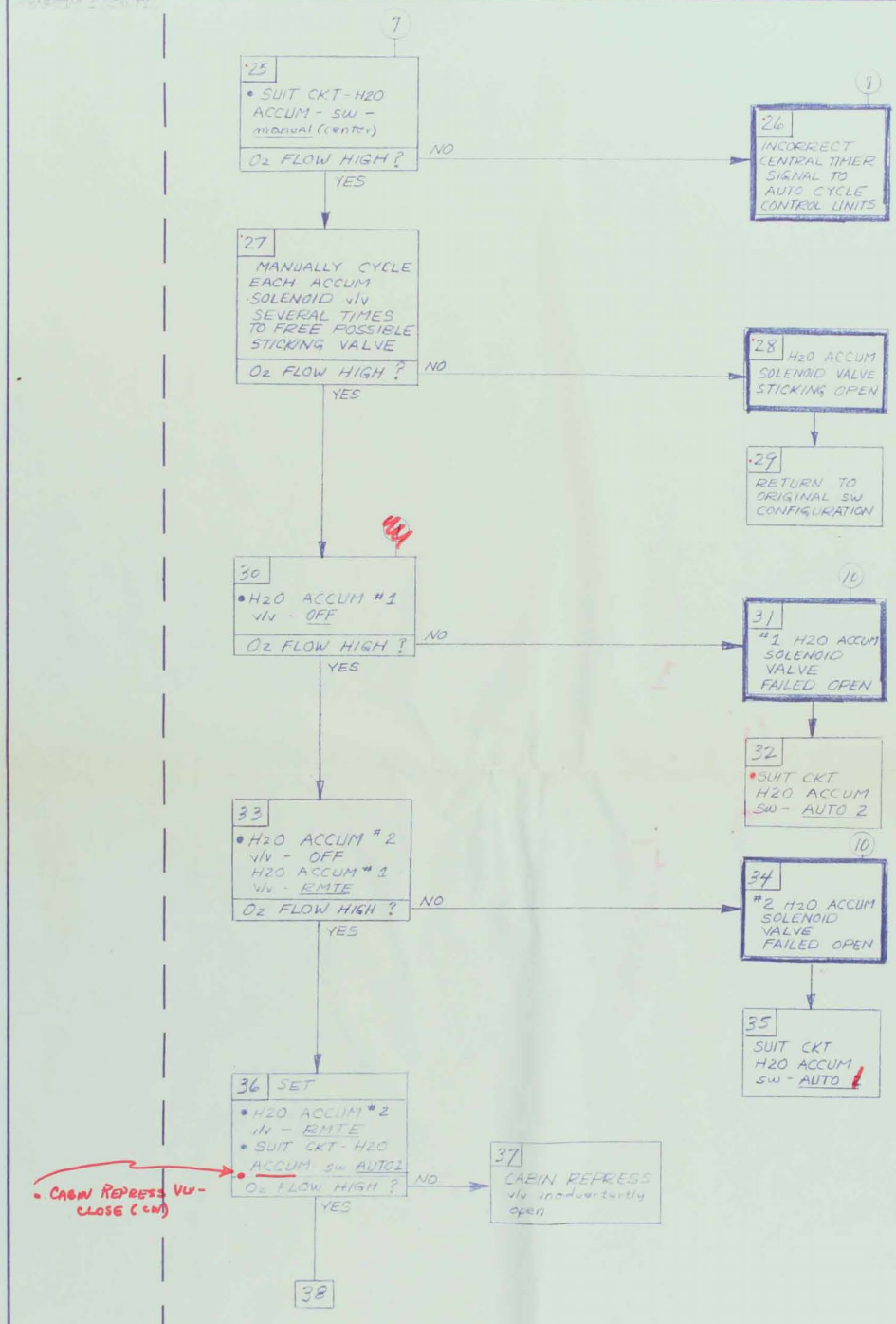
SYMPTOM	PROCEDURE	REMARKS



(7) [illegible] from H2O accum.

(8) H2O accumulation [illegible] operated.

(10) Loss of electrical control of H2O accumulators. Periodic manual valve operation the only means of actuating H2O accum.

G&N MALFUNCTION
SCS MALFUNCTION
SPS MALFUNCTION
RCS MALFUNCTION
EPS MALFUNCTION
T/C MALFUNCTION
ECS MALFUNCTION
SEQ MALFUNCTION

Basic Date _____ Change Date 11/14/67 Page _____

SYMPTOM	PROCEDURE	REMARKS

SYMPTOM 1 (CONT'D)

(11)

38 CLOSE EMER CABIN PRESS VLV
- EMER CABIN PRESS VLV - OFF

O2 FLOW HIGH ? NO → (12)

YES ↓

39 ATTEMPT PEEL VALVE RESEAT
- EMER CABIN PRESS VLV - BOTH
- EMER CABIN PRESS TO TEST PE - PRESS

O2 FLOW HIGH ? NO → 40 TEMPORARY PEEL VALVE SEATING PROBLEM

YES ↓

41.
- EMER CABIN PRESS VLV - 1

O2 FLOW HIGH ? NO → 42. NO 2 EMER CABIN PRESS REG FAILED

YES ↓

43. NO 1 EMER CABIN PRESS REG FAILED → • EMER CABIN PRESS VLV - 2

44
- EMER CABIN PRESS VLV - BOTH
- H2O/GLY TK PRESS REG VLV - OFF

O2 FLOW HIGH ? NO → 45
- H2O/GLY TK PRESS REG VLV - 1
- H2O/GLY TK PRESS REL VLV - 1

O2 FLOW HIGH ? NO → 46 H2O/GLY TK PRESS REG #2 FAILED HIGH OR RELIEF VLV #2 FAILED OPEN

YES ↓

47. CONTINUE OPERATION ON #1 REG & RELIEF VLV

(16) (15)

48. LEAK IN CABIN PRESS REGULATOR OR LEAK IN 100 PSI LINE DOWNSTREAM OF FLOW SENSOR

49
- H2O/GLY TK PRESS REG VLV - 2
- H2O/GLY TK PRESS REL VLV - 2

O2 FLOW HIGH ? NO → 50 H2O/GLY TK PRESS REG #1 FAILED HIGH OR RELIEF VLV #1 FAILED OPEN

YES ↓

51. DETERMINE LEAK RATE
- O2 DEMAND PRESS REG VLV - OFF
- Surge tank press decay rate used to determine magnitude of leak in cabin press REG or 100psi line

52. Continue operation on #2 REG & RELIEF VLV

53 LEAK DOWNSTREAM OF H2O GLY REL VLV

(16)

54 close
- H2O/GLY TK PRESS REG VLV - OFF
- H2O/GLY TK PRESS REL VLV - OFF

REMARKS

(11) [illegible]

(12) PRESS TO TEST switch [illegible]

(15) If leak is not isolated & the O2 flow remains high, it will be necessary to terminate the mission & return to earth before the supply of O2 is depleted to the point where it is necessary to maintain cabin press & O2 level.

(16) As required to isolate the leak the O2 DEMAND REG & RELIEF & H2O/GLY TK PRESS REG & RELIEF VLVs are to be in the BOTH position then OFF.

SYSTEMS MALFUNCTION: G&N MALFUNCTION | SCS MALFUNCTION | SPS MALFUNCTION | RCS MALFUNCTION | EPS MALFUNCTION | T/C MALFUNCTION | ECS MALFUNCTION | SEQ MALFUNCTION

SYMPTOM	PROCEDURE	REMARKS
2 O2 FLOW Ind - LOW Normal Range 0.2 to 0.45 lbs/hr	1 CHECK SURGE TK PRESSURE • O2 PRESS IND SW - SURGE TANK SURGE TANK PRESS LOW ? YES → ECS 4 NO 2 • VERIFY FLOW METER OPERATION BY MOMENTARY ACTUATION OF THE DIRECT O2 VALVE MOMENTARY O2 INCREASE? YES → 3 LOW SYSTEM DEMAND NO 4 O2 FLOW SENSOR OR FLOW INDICATOR FAILURE	①MSFN can distinguish between these two failures
3 SURGE TANK PRESS-HIGH > 935 PSIA	1 CRYO TK PRESS CHECK IS EITHER CRYO TANK PRESSURE HIGH ? YES → 2 CRYO O2 STORAGE FAILURE → EPS NO 3 SURGE TANK PRESSURE SENSOR FAILURE 4 • O2 PRESS IND SW - TANK 1	① Use highest CRYO TANK to ~~indicate~~ determine SURGE TANK Pressure

G&N MALFUNCTION
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SEQ MALFUNCTION

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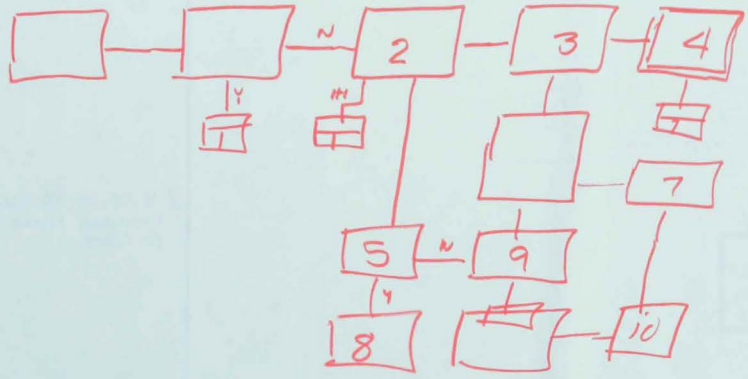

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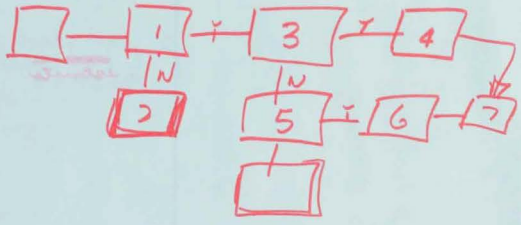

SYMPTOM	PROCEDURE	REMARKS

4 SURGE TANK PRESS - LOW (<865 PSIA)

1 CABIN PRESSURE HIGH? — YES → ECS 14 1 CABIN PRES HI.

No

2 O2 FLOW ind / O2 FLOW? — NORMAL → 3 • O2 PRESS IND SW - TANK 1 / CRYO TK PRESSURE LOW? — YES → 4 CRYOGENIC STORAGE SYSTEM FAILURE → EPS 1 1 CRYO PRESS

HI → ECS 1 2 O2 FLOW HI

LOW → 6 CHECK FOR O2 LINE OBSTRUCTION
- O2 PLSS VLV - OFF
- O2 SURGE TK VLV - OFF
- INCREASE O2 FLOW >1.0 LB/HR FOR 30 SECONDS BYPASS O2 - ON
- MONITOR O2 FLOW IND

O2 FLOW IND REMAINS AT 1.0 LB/HR? — YES → 7 SURGE TANK PRESSURE SENSOR FAILURE

No

5 • O2 SM SUPPLY VLV - OPEN / SURGE TANK PRESSURE DECREASES? INCREASES — No → 9 OBSTRUCTION OF OXYGEN RESTRICTORS, FILTERS OR LINE

YES → 8 INADVERTENT VALVE CLOSING

Warning: AN OBSTRUCTION SEVERELY LIMITS OXYGEN SUPPLY RATE. MAY ESSENTIALLY LIMIT SUPPLY TO THAT AVAILABLE IN CM (SURGE TANK PLUS O2 REPRESS PACKAGES)

7 → 10 REOPEN O2 VLVS
- O2 PLSS VLV - ON
- O2 SURGE TK VLV - ON

TBD

Serious departure from my notion of a serious form of poetic license

---

5 MSFN REPORTS O2 SYS PRESS HIGH (CF0036P) (>110 PSIA)

1 • READ CABIN PRESS / CABIN PRESS HIGH? — No → 2 O2 SUPPLY MANF PRESS TRANSDUCER FAILURE OR MAIN REG. ~~REGULATION~~ CALIBRATION SHIFT

YES

3 • MAIN REG VLV - 1 / MSFN REPORTS O2 SUPPLY MANF PRESS DECREASES? — YES (1) → 4 No. 2 MAIN O2 REG FAILED

No

5 CHECK OTHER REG • MAIN REG VLV - 2 / MSFN REPORTS O2 SUPPLY MANF PRESS DECREASES? — YES → 6 No. 1 MAIN O2 REG FAILED → 7 USE ALTERNATE MAIN REGULATOR

No

8 POSSIBLE FAILURE OF BOTH MAIN REGULATORS (1)

① If O2 flow rate does not decrease when Regulators are isolated, calibration has shifted but not up to relief pressure. Regulator is still usable.

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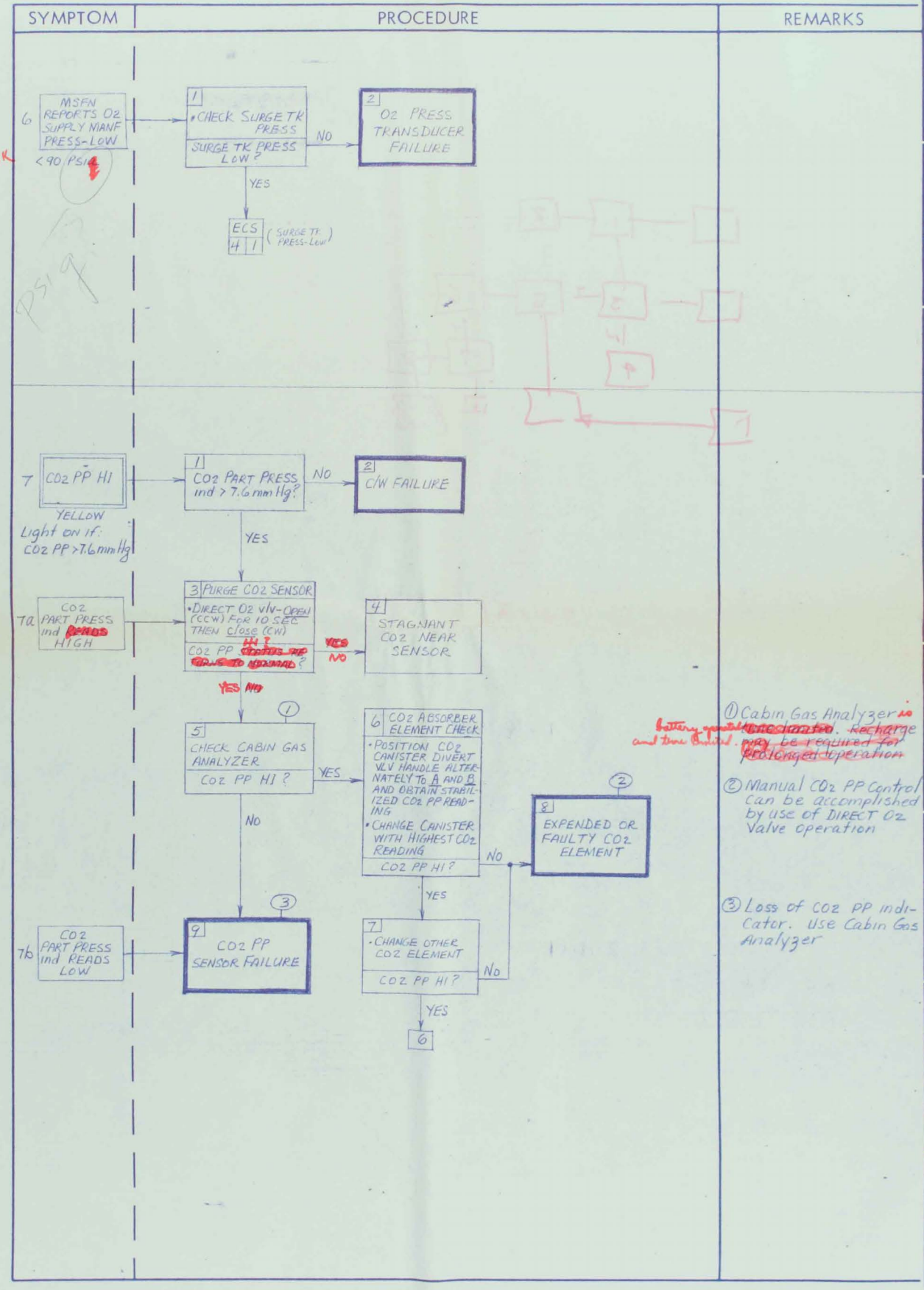

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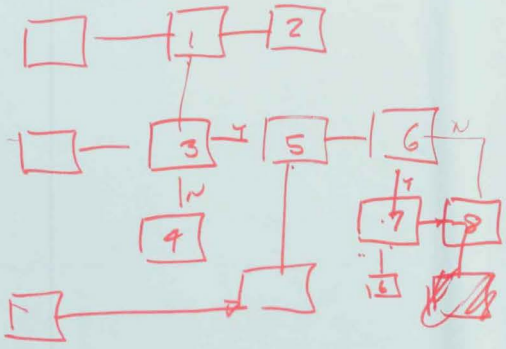
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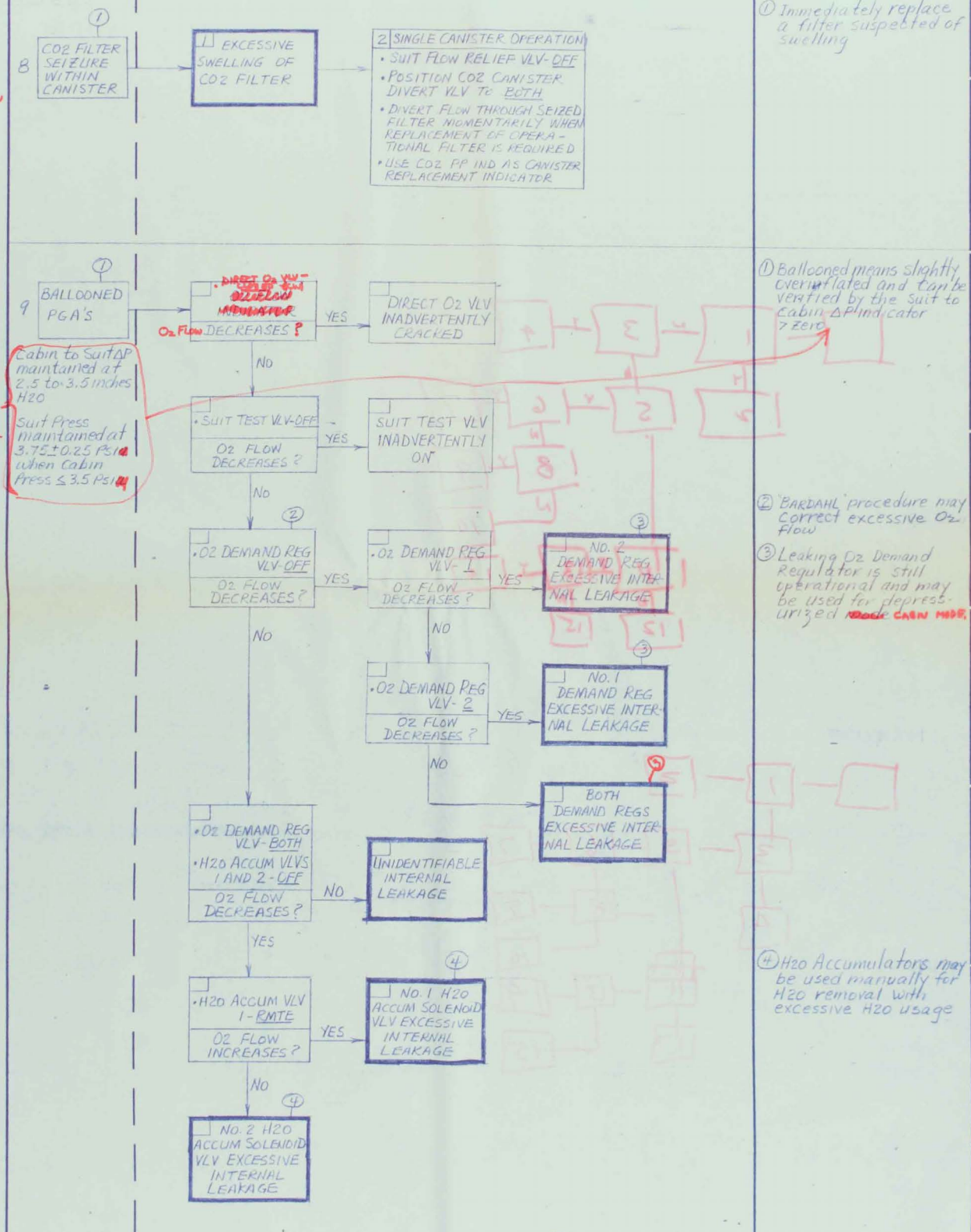
SYMPTOM	PROCEDURE	REMARKS



① Immediately replace a filter suspected of swelling

① Ballooned means slightly overinflated and can be verified by the suit to cabin ΔP indicator > zero

② 'BARDAHL' procedure may correct excessive O2 flow

③ Leaking O2 Demand Regulator is still operational and may be used for depressurized MODE CABIN MODE

④ H2O Accumulators may be used manually for H2O removal with excessive H2O usage

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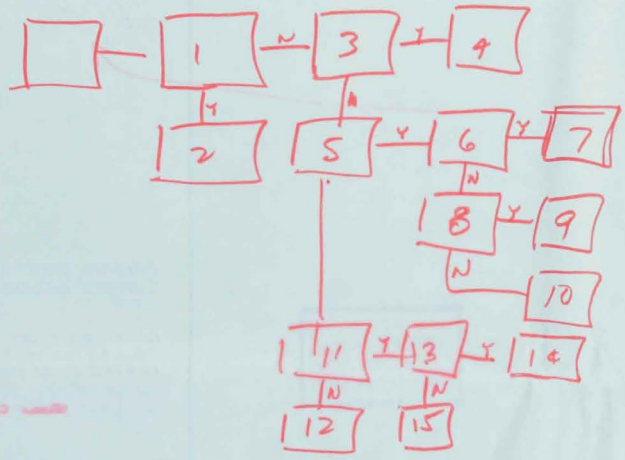
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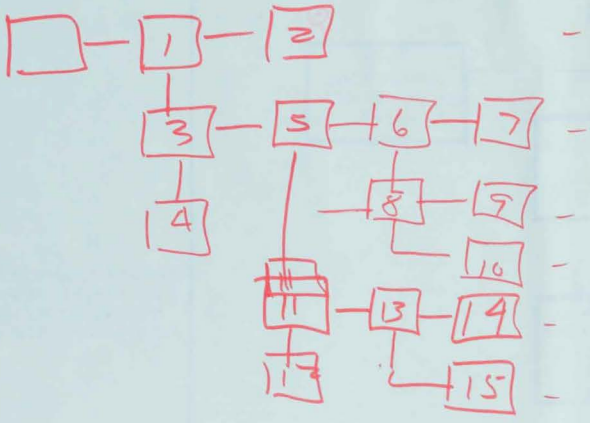
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NAA review
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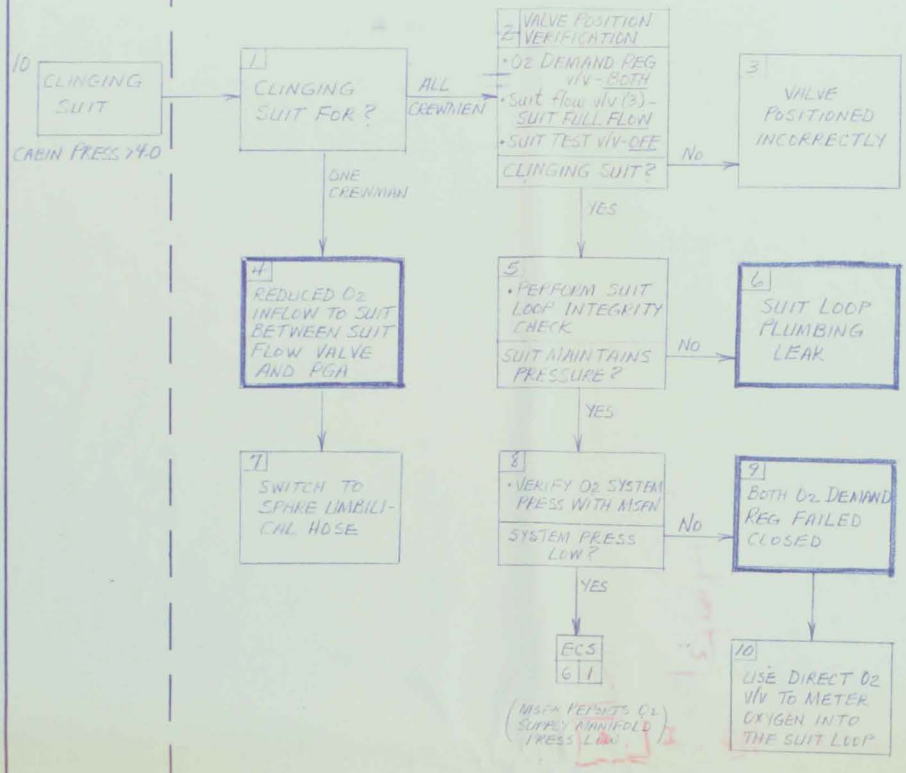
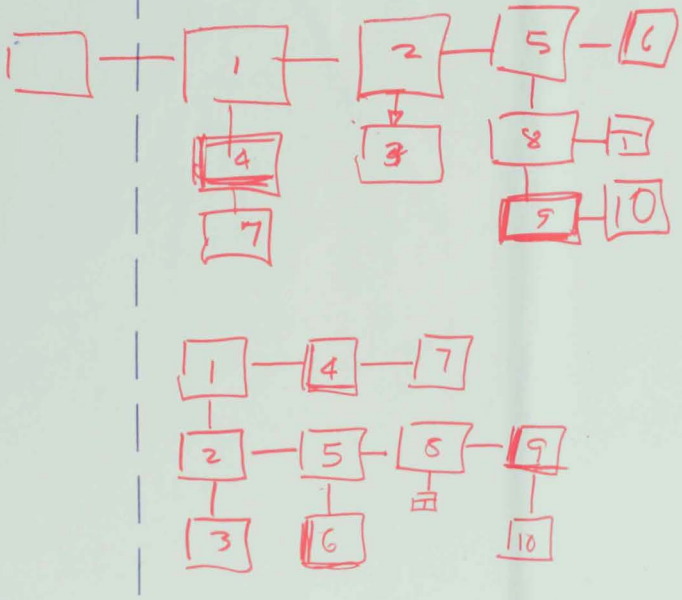
SYMPTOM	PROCEDURE	REMARKS





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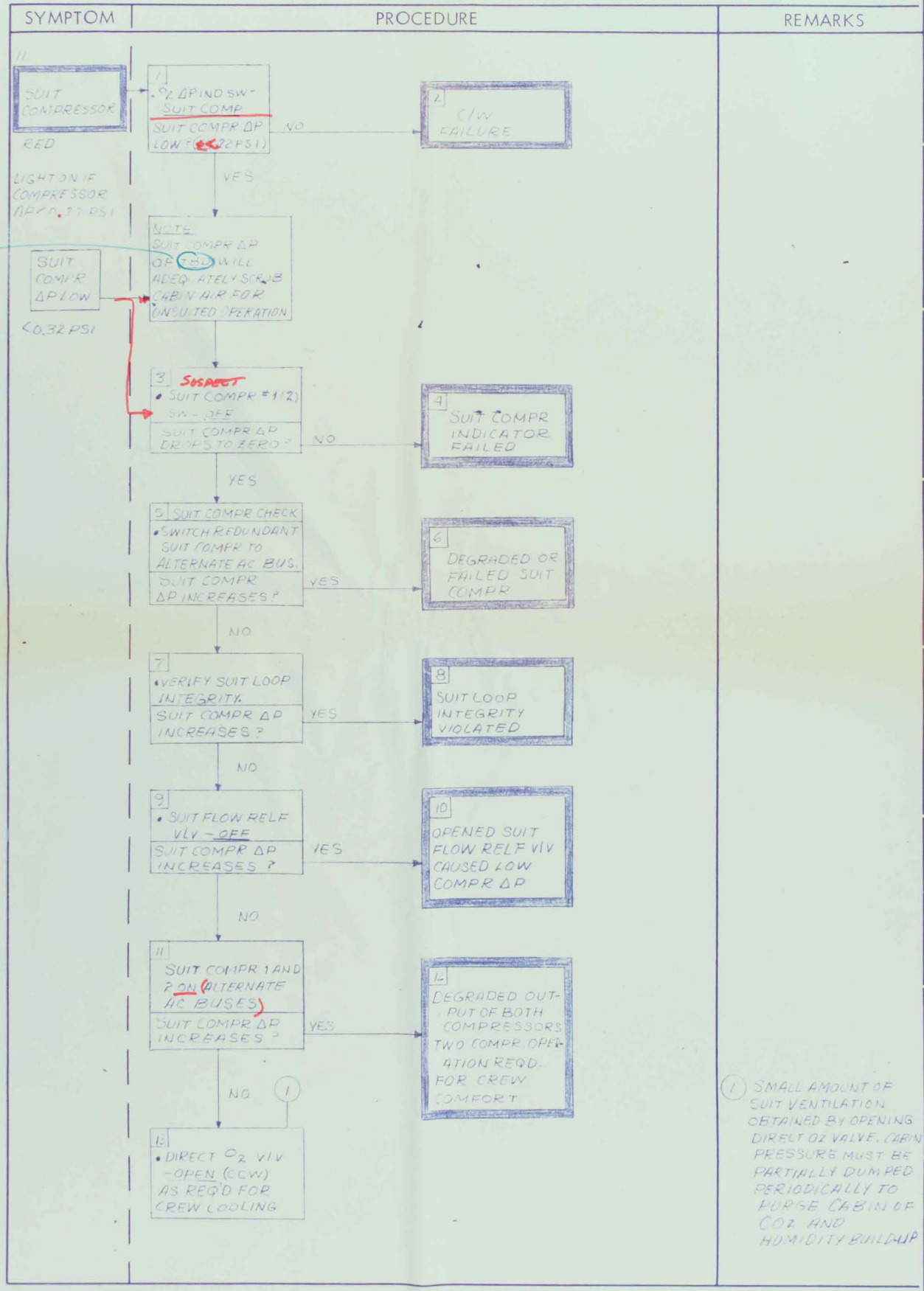

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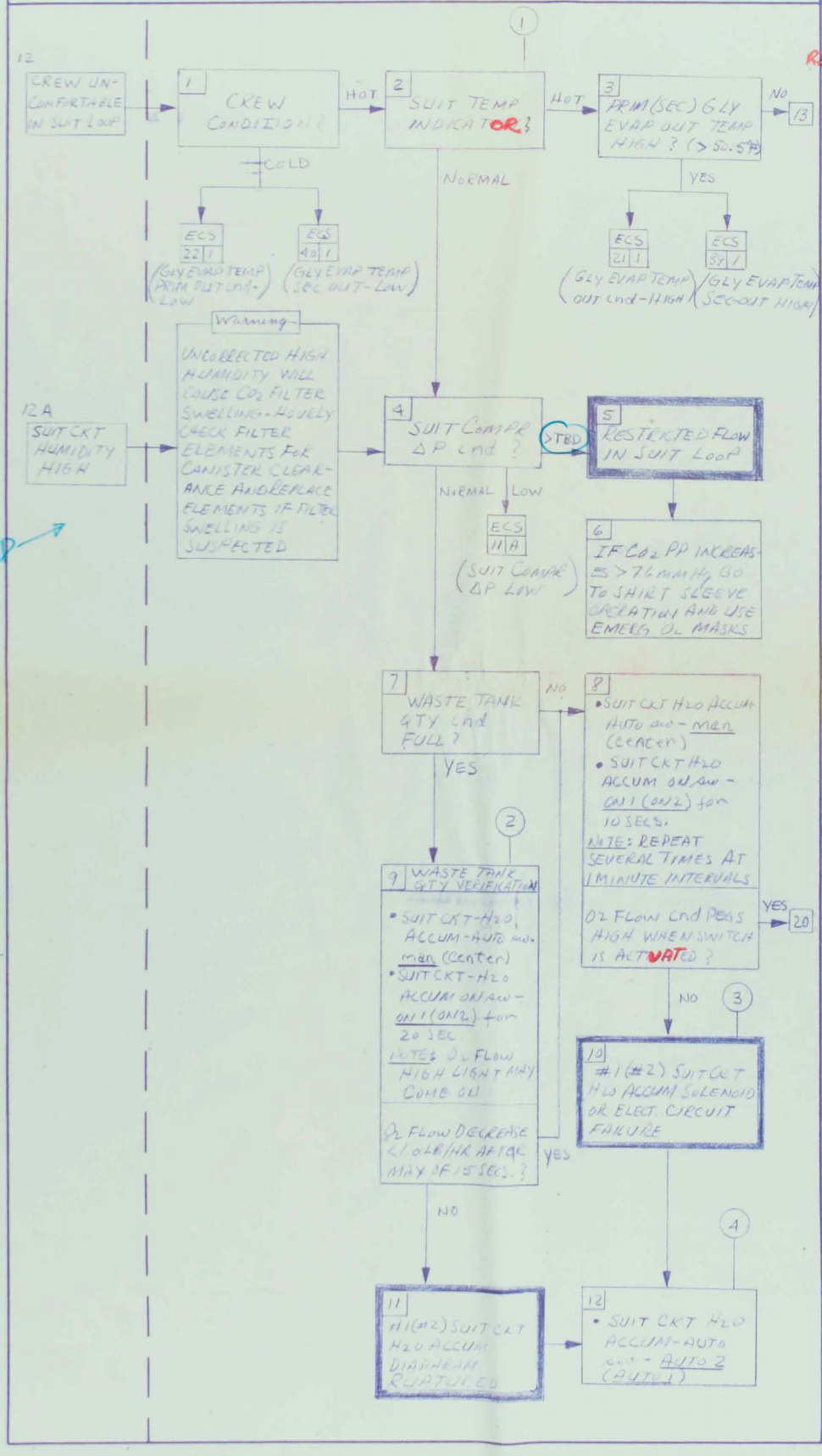
Suicide 12/13

12/13 NAA now flo 1gle

SYMPTOM	PROCEDURE	REMARKS



(1) ASSUMES SUIT FLOW RELIEF V/V - OFF

(2) QUANTITY VERIFICATION TEST IS VALID ONLY IF O2 FLOW RATE IS < .45 LB/HR BEFORE TEST.

(3) OPERATION OF #1 (#2) H2O ACCUM MAY STILL BE POSSIBLE. THIS CAN BE VERIFIED BY PLACING H2O ACCUM-1 (2) V/V - MAN FOR 10 SECS. AND THEN OFF, NOTING A HIGH O2 FLOW WHILE VALVE IS IN MAN POSITION

(4) OPERATION IS VERIFIED BY O2 FLOW CMD PEGGING HIGH WITHIN A TEN MINUTE PERIOD

G&N MALFUNCTION
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